

STAFF REPORT

TRANSPORTATION AND THE SAN FRANCISCO BAY

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SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION

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Adopted Bay Plan Transportation Findings and Policies

On October 20, 2005, the Commission adopted the following findings and policies, amending the Bay Plan transportation findings and policies. This information in this report, *Transportation and the San Francisco Bay*, serves as the basis for the adopted findings and policies.

Transportation

Findings and Policies Concerning Transportation On and Around the Bay

Findings

- a. The reliable and efficient movement of people and goods around the Bay Area is essential for the region's economic health and quality of life.
- b. The Federal Highway Administration and the Federal Transit Administration set federal priorities for planning and funding transportation projects. The California Transportation Commission sets the state's transportation priorities and the California Department of Transportation is responsible for planning, operating and maintaining the state's highways. Regional transportation planning for the Bay is coordinated by the Metropolitan Transportation Commission, and county congestion management agencies prepare transportation plans that establish funding and project priorities at the local level. A number of agencies plan and implement transportation projects and services, including rail, bus and ferry transit.
- c. In recent years, improvements to the Bay Area's transportation network have increased regional travel options available to residents traveling around and across the Bay. For example, the San Francisco Bay Area Rapid Transit District provides transbay service that connects the East Bay with San Francisco and the Peninsula. Ferry service connects San Francisco with communities in the North and East Bay, and frequent rail service links San Jose with San Francisco and connects the Bay Area with Sacramento and the San Joaquin Valley. In addition, high-occupancy vehicle lanes for use by buses and carpools are common on the region's highways. However, the predominant form of travel in the Bay Area continues to be the single-occupant vehicle.
- d. Primary reliance on the single-occupant vehicle for transportation in the Bay Area means further pressures to use the Bay as a route for future roadways and bridges. Therefore, a primary goal of transportation planning, from the point of view of preserving and properly using the Bay, should be a substantial reduction in dependence on the single-occupant vehicle. While single-occupant vehicles will still be needed and used for many types of travel, the goal should be the improvement and expansion of systems of transportation that can carry large volumes of people and goods without damaging the environment of the Bay Area, including increased air and water pollution and shoreline space devoted to roadways and parking.
- e. While the McAteer-Petris Act identifies bridges as water-oriented uses, roads are not water-oriented uses because roads do not need to be located in the water to function properly and do not take advantage of some unique feature of water.

- f. Pressure to fill the Bay for surface transportation projects can be reduced by: improving the efficiency and increasing the capacity of existing transportation facilities and services, increasing access to public transit, providing safe and convenient public pathways for non-motorized forms of travel (e.g., bicycles, pedestrian), and by accommodating more of the region's growth in denser, mixed-use neighborhoods around transit stations and terminals.
- g. The efficient and prompt movement of cargo to and from Bay Area airports and seaports is critical to the health of the state and regional economy. The Bay is a potentially important resource for moving cargo within the region by barge or ferry.
- h. The Bay represents an important resource for ferry transportation. Locating ferry terminals near centers of employment, commerce and housing or in areas with connections to other forms of transit can improve regional mobility and increase access to the Bay. Because ferry routes can cross shipping lanes, water recreation areas and areas used by water birds and marine mammals, care in the planning and siting of ferry routes and terminals must be taken to ensure safe navigation and the protection of Bay fish and wildlife resources and their habitats.
- i. A continuous network of paths and trails linking shoreline communities and crossing the Bay's bridges is a vital component in a regional transportation system and provides travel alternatives to the automobile.
- j. Roadways, rail lines and other transportation facilities can provide views and vistas of the Bay; however, if not properly designed and constructed, these facilities can form barriers that separate communities from the Bay and block public access to the shoreline.
- k. Transportation projects have the potential to degrade air quality, increase noise, impact mobility, eliminate open space and impede the public's access to the Bay. These impacts have often been disproportionately distributed in the Bay Area, commonly having greater impacts on low-income and minority communities. These disproportionate impacts have resulted in these communities having fewer opportunities for shoreline public access and views to the Bay, fewer shoreline recreational opportunities and fewer natural habitats.
- l. Transportation projects located in the Bay or along its shoreline have the potential to result in shoreline erosion from ferry wakes, increased pollution from runoff, and harm to marine mammals and fish from pile-driving for bridges and piers and to subtidal habitats from increased turbidity.

Policies

1. Because of the continuing vulnerability of the Bay to filling for transportation projects, the Commission should continue to take an active role in Bay Area regional transportation and related land use planning affecting the Bay, particularly to encourage alternative methods of transportation and land use planning efforts that support transit and that do not require fill. The Metropolitan Transportation Commission, the California Department of Transportation, the California Transportation Commission, the Federal Highway Administration, county congestion management agencies and other public and private transportation authorities should avoid planning or funding roads that would require fill in the Bay and certain waterways.

2. If any additional bridge is proposed across the Bay, adequate research and testing should determine whether a feasible alternative route, transportation mode or operational improvement could overcome the particular congestion problem without placing an additional route in the Bay and, if not, whether a tunnel beneath the Bay is a feasible alternative.
3. If a route must be located across the Bay or a certain waterway, the following provisions should apply:
 - a. The crossing should be placed on a bridge or in a tunnel, not on solid fill.
 - b. Bridges should provide adequate clearance for vessels that normally navigate the waterway beneath the bridge.
 - c. Toll plazas, service yards, or similar facilities should not be located on new fill and should be located far enough from the Bay shoreline to provide adequate space for maximum feasible public access along the shoreline.
 - d. To reduce the need for future Bay crossings, any new Bay crossing should be designed to move the largest number of travelers possible by employing technology and operations that increase the efficiency and capacity of the infrastructure, accommodating non-motorized transportation and, where feasible, providing public transit facilities.
4. Transportation projects on the Bay shoreline and bridges over the Bay or certain waterways should include pedestrian and bicycle paths that will either be a part of the Bay Trail or connect the Bay Trail with other regional and community trails. Transportation projects should be designed to maintain and enhance visual and physical access to the Bay and along the Bay shoreline.
5. Ferry terminals should be sited at locations that are near navigable channels, would not rapidly fill with sediment and would not significantly impact tidal marshes, tidal flats or other valuable wildlife habitat. Wherever possible, terminals should be located near higher density, mixed-use development served by public transit. Terminal parking facilities should be set back from the shoreline to allow for public access and enjoyment of the Bay.

Fills in Accord with the Bay Plan

- b. The filling is in accord with Bay Plan policies as to purposes for which some fill may be needed if there is no other alternative (i.e., airports and utility routes); or

CONCLUSIONS AND RECOMMENDATIONS

The Bay, which historically separated and continues to separate residents and businesses from the places that they want and need to go, has often been viewed as an obstacle to mobility around the region. Prior to the early 1950s, before the majority of the bridges were in place and the widespread use of the automobile was a fact of life, people moved across the Bay by ferry boat. Ferry boats carried 50 to 60 million persons annually and 250,000 people moved through the San Francisco ferry building each day. The Key System, an interurban rail system that operated in the East Bay connected riders to a ferry for their trip to San Francisco. The Key System later extended across the Bay Bridge, with two tracks of rail right-of-way on the lower deck of the bridge. The trains used only one-fifth of the bridge area, but the Key System carried approximately two-thirds of the people using the bridge. As the suburbs grew and automobile use increased, the Bay began to fill with bridges and the shoreline with roadways. The first bridge placed in the Bay, the Dumbarton Bridge, was constructed in 1927 and the most recent bridge built to span the Bay, the Benicia-Martinez Bridge, was constructed in 1962. As the state focused planning and funding on bridge and roadway projects, the public transit system that once knitted the region together was all but eliminated: the Key System was removed from the Bay Bridge, the operation of ferry routes in the bridge corridors was made illegal by state law.

In the mid-1960s, the region's roadways and bridges became significantly congested. As the number of people and jobs grew in the region and more women joined the workforce, the region's infrastructure was being asked to move increasing numbers of goods and people without the aid of public transit systems. The pressure to fill the Bay with more bridges and roadways became significant. Proposals to alleviate the congestion of transbay crossings and shoreline roadways included a bridge south of the San Francisco Bay Bridge, the widening of Interstate 80 and Highway 101, the addition of a second deck to the Golden Gate Bridge and a tunnel beneath the Bay for a new rapid rail system. The fight to protect the Bay was greatly stimulated by proposals for transportation infrastructure in or bordering the Bay. In recognition of the threat, the *San Francisco Bay Plan* (Bay Plan) included findings and policies specific to transportation planning and the adverse impacts to the Bay that could result from the emphasis the region had placed on automobile.

Although the construction of the bridges and the interstates, highways and roadways was critical to the growth of the region and its economy, this construction resulted in elimination of Bay habitats, degradation of water quality, created many barriers between the region and the Bay and resulted in more pressure to fill the Bay. Roadways and railroad tracks created a permanent barrier between the ecological communities in the uplands and those ecological communities along the Bay shoreline. Transportation infrastructure along the Bay shoreline also directly eliminated many of the upland habitats that once had a critical relationship to the Bay, supplying it sediment, providing a filter to remove pollutants before they reached the Bay and providing habitat for species that relied on both the Bay and its uplands for survival.

Many of the region's most significant transportation corridors are either over the Bay or along the Bay's shoreline, including major interstates, highways, bridges, frontage roads, railroad tracks, rail lines and ferry terminals. Although many types of development have impacts on the Bay and its shoreline, the scale, reach and nature of transportation infrastructure make it unique from other types of Bay fill and development in the shoreline. Transportation infrastructure often provides little or no opportunity for access through or across it. With railroad tracks and roadways, it is not possible for the purposes of both safety and function to place an accessway through a project for the movement of people or other species. In most cases, the only viable access options to cross these corridors are bridges over the infrastructure or tunnels underneath it. Transportation infrastructure is often large in scale, so the adverse impacts are over larger areas and are often more visible than other types of projects. The toll plazas, support structures and entrances to bridges are large structures that can restrict public access to the Bay and eliminate or degrade ecological resources at the site.

Transportation infrastructure also has impacts on the development and movement of the entire region. The construction of a new rail or ferry transit station or the addition of lanes on an interstate can result in additional growth in the area surrounding the new infrastructure. Appropriate growth presents the opportunity for higher density, mixed use development that accommodates pedestrian and bicycle movement and supports a new transit station. Inappropriate growth can result in isolation from the existing urban fabric of the area, an increase in dependency upon the single-occupancy vehicle, and adversely impact sensitive ecological areas.

The work of BCDC, the Association of Bay Area Government's Bay Trail Project and other regional and local agencies has attempted to address adverse impacts to public access by significantly increasing the amount of access to the Bay and along its shoreline, overcoming a number of obstacles presented by transportation facilities in the process and giving people the option to walk and bicycle rather than drive their car to and along the shoreline. Examples of such projects include the pedestrian and bicycle pathways that were required for the Zampa Bridge and the east span of the Bay Bridge, as well as the public access requirements for the Interstate 80 high-occupancy vehicle lane. These new public access areas are opening up areas of the Bay shoreline to the public and surrounding communities that have been cut off from the Bay for years, increasing recreational opportunities and alternatives for mobility. The increase in ferry service around the Bay can increase public access both to and on the Bay by providing people with a safe and easy way to travel to the new terminals, enabling them to leave their cars at home.

The pressure to fill the Bay and its shoreline for transportation projects has changed since BCDC was created by the legislature in 1965, but remains, as does the need for residents and commerce to cross the Bay and traverse its shoreline. Since the Bay Plan policies were first adopted by the Commission in 1968, there have been a number of changes in Bay Area transportation options, infrastructure and in public opinion on transportation issues. Soon after BCDC was created, the San Francisco Bay Area Rapid Transit District (BART) was established and now moves significant numbers of people by rail across the Bay within the Bay Bridge corridor. More recently, the San Francisco Bay Area Water Transit Authority (WTA) was created by the legislature to develop and implement a plan to increase commuter ferry service around the Bay Area. A number of other ferry transit providers, such as the Golden Gate Bridge and Transportation District and Blue and Gold Fleet have been operating successful ferry service around the Bay Area, including a route that links the City of Vallejo and the City of San Francisco, saving commuters approximately 25 minutes over those who drive the route. The Capitol Corridor Joint Powers Authority, using the Union Pacific Railroad tracks that cross the Bay east of the Benicia-Martinez Bridge, has been steadily increasing train service between Sacramento and San Jose. Other rail service has been established or is being planned and operated by joint powers authorities, including the Altamont Commuter Express (ACE) trains that link the San Joaquin County with the East and South Bay and the Caltrain service from the South Bay and the Peninsula to San Francisco. The California High Speed Rail Authority was established in 1996 to plan, design, construct and operate a high speed rail system for the State of California. BART is planning a number of expansions in the East and South Bay. In an effort to create a more coordinated and connected regional transit system, in 2001 the Transbay Joint Powers Authority was created to develop a new inter-modal transit center in San Francisco, at the site of the existing Transbay Terminal. This work will include an extension of Caltrain service to the new transit center, which is planned to have stations for AC Transit, Greyhound, MUNI, BART, SamTrans, Golden Gate Transit, Caltrain, para-transit services, Caltrain and the proposed California High Speed Rail service. The Sonoma Marin Area Rail Transit District (SMART) was established by the legislature in 2003 to plan and implement new rail service in Sonoma and Marin Counties, while in the South Bay there is a proposal to re-establish rail service across the Bay on a rehabilitated Dumbarton rail bridge. AC Transit is working on a project that would provide Contra Costa and Alameda Counties with Bus Rapid Transit (BRT),

which has been successfully established along San Pablo Avenue, and serving seven cities across two counties.

The Metropolitan Transportation Commission (MTC) and the California Department of Transportation (Caltrans) have been improving efficiencies and increasing capacity on existing infrastructure with metering lights, the FastTrak electronic toll payment program, improved toll booth operations, the addition of high-occupancy vehicle (HOV) lanes and other operational improvements. The Port of Oakland has improved the movement of cargo in and out of the Port facility with the Joint Intermodal Terminal project, which allows the Port to move more cargo by rail, reducing the number of trucks that must travel along the region's bridges and roadways.

As the number of transportation options increases in the Bay Area, the opinions of the residents and businesses are also shifting regarding transportation. Although congestion remains the most significant concern for people in the Bay Area, as shown year after year and in poll after poll, people increasingly support different ways to address this congestion. The once popular, "build more roadways, add more lanes" solution fails to receive the support it once did. Seeing the expense, community and ecological impacts and the inability of new lanes to significantly reduce congestion, the region's residents have shown more support in recent polls for projects that increase the efficiency of existing infrastructure, link transportation and land use decisions, and increase public transit options.

Transportation policy makers and planners are attempting to balance regional air quality requirements with necessary transportation improvements, to improve mobility on constrained budgets, and to reduce the ecological and community impacts of transportation projects. In order to achieve these objectives policy makers and planners have increasingly moved away from adding new roadway lanes to serve the single-occupancy vehicle and towards increasing and improving public transit, linking transportation and land use decisions, and increasing the efficiency of existing infrastructure. MTC has adopted the Transportation and Land Use Initiative that prioritizes funding for new transit stations on the presence of, or plan for, transit supportive land uses within one half mile of the new stations. The joint powers authority that is developing the SMART project for Sonoma and Marin Counties is incorporating ways to attract and develop transit supportive land uses around new stations and decrease the number of people that must drive to and park at the new stations. BART is looking at ways to develop transit supportive land uses around existing and proposed stations and has already completed such projects at the Fruitvale and Pleasant Hill stations. The WTA is considering the concept of the Water Transit-Oriented Development for appropriate locations around existing and proposed ferry terminals. In San Francisco, the Transbay Joint Powers Authority and the San Francisco Redevelopment Agency are working together to ensure that the area around the proposed Transbay Terminal project includes high-density housing and results in a neighborhood that is pedestrian-friendly and provides new residents with easy access to a number of transit options that serve not only the city of San Francisco, but regional destinations such as the San Francisco International Airport.

All of this is good for the Bay and its residents and businesses: transportation and land use projects that add to the region's transportation options and mobility by increasing access to public transit and improving the capacity and efficiency of existing infrastructure will improve the movement of all the region's people and the transport of goods and services around and over the Bay with the minimum amount of fill necessary and little impact to public access to the Bay.

But regardless of how efficient the Bay Area is with its existing transportation infrastructure and public transit and land use decisions, there will still be pressure to fill the Bay for transportation projects and to locate transportation projects along its shoreline. Projections for transbay travel, which accounts for approximately four percent of the region's travel, show that it will outpace other types of travel around the region, increasing 40 percent by 2025. Therefore, it is important that BCDC has policies that will allow for the development of needed infrastructure while preserving the Bay and its resources and ensuring that access to the Bay is

not blocked by transportation projects. An update to the existing transportation findings and policies is needed to address the current Bay Area transportation issues, the types of projects that are most likely to be proposed within BCDC's jurisdiction and the impacts to the Bay and its resources that could result from these projects.

While the intent of the proposed findings and policies regarding roadways and bridges remains the same as that in the existing findings and policies, the language is updated and the proposed policies also identify the impacts that transportation projects can have on the Bay. While still supportive of increased ferry service on the Bay, the proposed findings and policies identify the importance of location and design to avoid significant wake, dredging, wetland, recreation, public access and other adverse impacts to Bay resources. The impacts that transportation projects have on public access are identified, as is the importance of non-motorized transportation as a transportation option and an alternative way to travel to public transit. For the purposes of this report and the accompanying staff recommendation, the term "public access" is defined by the *San Francisco Bay Plan* (Bay Plan) Public Access Finding c which states, in part, "Public access required by the Commission is an integral component of development and usually consists of pedestrian and other non-motorized access to and along the shoreline of San Francisco Bay. It may include certain improvements, such as paving, landscaping, and street furniture; and it may allow for additional uses, such as bicycling, fishing, picnicking, nature education, etc. Visual access to the Bay is a critical part of public access." The public access section of the Bay Plan also includes a policy regarding roadways near the edge of the water and transportation access to the Bay. This policy states, "Roads near the edge of the water should be designed as scenic parkways for slow-moving, principally recreational traffic. The roadway and right-of-way design should maintain and enhance visual access for the traveler, discourage through traffic, and provide for safe, separated, and improved physical access to and along the shore. Public transit use and connections to the shoreline should be encouraged where appropriate." The proposed amendment to the transportation section of the Bay Plan is meant to compliment and not be redundant with the public access section of the Bay Plan. In order to avoid redundancy and to respect the original intent of the transportation findings and policies, the proposed amendment does not include the concept of transportation access to the Bay, but rather continues to focus on reducing fill in the Bay associated with transportation projects and to minimizing the potential impacts associated with transportation projects within BCDC's jurisdiction.

The primary focus of the proposed transportation findings and policies remains the same as the focus of the existing findings and policies: to reduce the pressure to either fill the Bay or locate roadways and bridges within its shoreline. The purpose of the update is to anticipate the types of projects that are likely to be proposed within the Commission's jurisdiction over the next 10 to 20 years and to ensure that those projects will be developed in a way that reduces impacts to Bay resources and enhances public access to the Bay. The types of projects that could possibly be proposed within the Commission's jurisdiction in the next 10 to 20 years are discussed in more detail in the following report and may include HOV/High-Occupancy Toll (HOT) lanes, improvements to existing rail infrastructure, work on State Route 37, new ferry terminals and routes, the continued seismic strengthening on existing elevated roadways and bridges, capacity and safety improvements to interchanges, the High Speed Rail project, new rail terminals and improvements to cargo movement in and out of the Port of Oakland that could include cargo ferries or new rail service.

The proposed update to the transportation findings and policies continues to acknowledge the importance of BCDC's participation in Bay Area regional transportation and land use planning affecting the Bay, particularly to encourage alternative methods of transportation to be used within the Bay Area that do not require Bay fill. The Commission has a voting member on MTC and BCDC staff has served on technical and planning advisory committees for a number of regional transportation and land use policy projects, including MTC's 2000 Bay Crossings Study, the WTA's Implementation and Operations Plan, the Smart Growth Initiative and MTC's Transportation and Land Use Task Force. Continued participation in these regional

transportation and land use planning efforts will enable BCDC to ensure that these regional planning efforts move forward in a way that balances the transportation demands in the region with the Bay's resources and public access.

CHAPTER 1

TRANSPORTATION CONDITIONS IN THE BAY AREA

Surface transportation in the Bay Area relies on a complex network of roadways, bridges, conventional, rapid and light rail lines, bus lines, ferry routes, truck routes, high-occupancy vehicle lanes, and non-motorized transportation such as pedestrian paths and bicycle lanes to move people and goods within and through the region as efficiently as possible. The system is planned, designed and managed by a number of local, regional, state and federal agencies. These surface transportation networks affect both the quality of life in a region and the health of the region's economy. Congestion results in people sitting in traffic instead of spending time with family, working and recreating. Goods sit on the freeway rather than reaching their destination, resulting in increased costs to the consumer and additional time for everything that is produced in, or just traveling through, the region.

The Bay Area Council reported in 1997 that declining mobility costs the Bay Area approximately \$3.5 billion annually in lost productivity and wasted resources. A typical workday in 1998 cost commuters 112,000 vehicle hours in lost working time, estimated to be worth approximately \$1,250,000 to the region¹. Congestion and its social and economic costs is projected to increase over the next 20 years. When polled, Bay Area residents have repeatedly identified transportation as the single most important issue facing the region. In polls of residents taken in 1987, 1999, 2001 and 2004 transportation was identified as the number one concern facing the Bay Area.² In the United States, there has been a 236 percent increase in time spent in traffic since 1987. In the year 1980, 64 percent of all commute trips were made alone in an automobile. Today's percentage of people commuting alone is between 80 and 90 percent.³ People are not only driving for commute purposes, they are also taking their cars for most of their other trips.

Transportation planners, the public and policy makers have been debating the best way to address congestion in urban areas for over 40 years. Many once felt that the solution was simply to widen roadways and build new ones. When people propose adding lanes to solve congestion they make two potentially unproven assumptions. First, that congestion can be solved in an urban region, and second, that current transportation infrastructure in the corridor is being used as efficiently as possible and that there are no alternatives for increasing the capacity of the infrastructure in that corridor. As to the issue of congestion in general, as Anthony Downs described in his article *Why Traffic Congestion is Here to Stay...and Will Get Worse*, "[R]ising traffic congestion is an inescapable condition in all large and growing metropolitan areas across the world." Downs describes the reasons for this congestion in the United States as, "[i]n the United States, the vast majority of people wanting to move during rush hours use private vehicles, for two reasons. One is that most Americans reside in low-density settlements that public transit cannot serve effectively. Second, for most people private vehicles are more comfortable, faster, more private, more convenient in trip timing, and more flexible than public transit." Downs goes on to suggest that most of the options available to a region, such as peak-hour toll charges, greatly expanded roadway capacity and greatly expanded public transit capacity, are either politically infeasible or physically or financially impossible. He recommends that regions "live with congestion" and finds that congestion is a result of a strong economy and an essential mechanism for coping with excess demand for road space. As the congestion on the roadways reaches a point at which some of the primary benefits of the private vehicle—the flexibility,

¹ Bay Area Council. 1998. Water Transit Initiative: Facts and Figures.

² Bay Area Council. 1987-2004 Polls.

³ Putnam, Robert D. 2000. *Bowling Alone: The Collapse and Revival of the American Community*. Simon and Schuster

speed and comfort—are diminished or disappear, people will begin to shift to other modes of transportation. However, this is only an option for those people that live in communities that can be served by public transit.

The Bay Area provides a ready example of Downs' theory by looking at the impacts that the recent economic shifts have had on the region's transportation systems. When the economy was strong and growing in the late 1990s, the bridges and roadways were at capacity for longer peak periods and public transit ridership was also high as the region attempted to move more people and goods. As congestion on the roadways and bridges became intolerable to a certain number of people, people who had the option to alter their transportation patterns and modes shifted to other transportation modes, ceased traveling certain corridors at peak periods or participated in carpools. Congestion on the roadways and public transit ridership decreased when the economy began to contract and the region began to lose jobs.

So, it is possible that the question should not be how to solve congestion, but how to improve mobility and to increase the transportation options available in the region. Improving mobility addresses the second assumption about increasing roadway capacity—is the existing infrastructure in the corridor being used as efficiently as possible and what are the alternatives for increasing the capacity within each corridor? The Metropolitan Transportation Commission's (MTC) 2000 *Bay Crossings Study* attempted to answer this question for the central Bay crossings. The study was initiated during the period of economic growth and analyzed a variety of solutions to congestion, including HOV lanes, express buses, a new bridge, the expansion of existing bridges, a new tunnel under the Bay for the San Francisco Bay Area Rapid Transit (BART) system, increased density around transit stations and urban centers and technical and operation improvements to the existing surface transportation infrastructure.

Transportation Pressures on the Bay. When the Bay Plan was adopted in 1968, the pressure to place fill in the Bay for new roads and bridges was considerable. During the 1950s, most of the Bay Area's public transit had been reduced and eliminated and as the region grew. This combination of factors meant growth in the number of automobiles traveling across the Bay and pressure to build more roadway infrastructure to accommodate these automobiles. The location and type of development in the Bay Area also increased the reliance on the single-occupant vehicle, as much of the new development in the region was outside of the existing cities and consisted of low-density housing and single-purpose land uses. In response to this pressure, the Bay Plan included findings and policies on transportation. The transportation policies have not been comprehensively updated since they were developed in 1968. However, there have been two focused amendments. The first was the addition of a finding in 1989 which stated that roads are not water-oriented uses. The second amendment was the 2001 addition of another finding, this time identifying that there are a large number of ferries on the Bay and the potential for these ferries to have impacts on Bay resources.

Over the past 37 years, there have been a number of changes with respect to the Bay Area's surface transportation network which should be acknowledged in the Bay Plan. BART has been constructed and in use for many years; a plan has been approved for expanding ferry service in the Bay; many of the bridges across the Bay have been seismically retrofitted, replaced or expanded; and transportation planners and the population of the Bay Area no longer favor building more roadways for single-occupant vehicles as a way to solve the region's congestion problems. New proposals include linking transportation and land use decisions; developing a system of high-occupancy vehicle lanes for use by buses, carpools and possibly single drivers willing to pay a toll; increasing connections between transit services; increasing transit options through the expansion of ferry service, express buses and additional rail service; and employing the existing transportation infrastructure more efficiently by using new technologies and system management tools.

In spite of all of these changes, transportation projects continue to have the potential to significantly impact Bay resources. Transportation pressures on the Bay and the congestion associated with transbay travel continue to be of significant regional concern. During the course of its *Bay Crossings Study* conducted in 2000, MTC projected that transbay travel would increase

40 percent by the year 2025 and that transbay travel would outpace the average regional rate of growth in travel. BCDC recognized the potential for transportation projects to impact the Bay when it adopted a set of transportation objectives in 2002. These objectives were designed for staff to use when working with MTC on updates to its *Regional Transportation Plan* (RTP) and included language to discourage fill in the Bay, its tidal marshes, tidal flats, salt ponds, managed wetlands and the ecological transition zone for new transportation improvements and encouraged roads and transportation improvements to be designed in a way that avoided impacts to the public's visual and physical access to the Bay.

The Bay presents a significant obstacle to transportation in the Bay Area. The Bay is a regional environmental, recreational and economic asset and filling the Bay for transportation projects is currently not seen as a regionally acceptable solution to solving the Bay Area's congestion problems. However, the Bay does separate people from jobs, families and recreation. As has been noted, transbay crossings contribute to a number of the most congested sites in the Bay Area. Many transbay crossings are congested during commute hours and on evenings and weekends. The difficulty is finding ways to keep people and goods moving in the region, while protecting the Bay's resources. Due to financial constraints, environmental and social impacts and transportation demand, it would be impossible to build enough bridges and roadways to significantly reduce transbay congestion. Additionally, roadway expansions and new roadway development is a very expensive tool to address congestion. Roadway and bridge projects often take many years to plan, permit and build and require a significant amount of future transportation funding for maintenance. Likely, the best options for increasing mobility in the transbay crossings is to increase the capacity of transbay corridors by providing public transit alternatives, developing a network of high-occupancy vehicle (HOV) lanes and improving the efficiency of the existing infrastructure in the corridors. Another important component to improving mobility in the Bay Area is to recognize the importance that land use decisions have on congestion and mobility in the region. If the region continues to develop low-density communities served by wide arterials and large amounts of parking, it will be difficult for people in the region to use alternative modes of transportation and they will continue to drive alone. Without land use decisions that support public transit, walking and cycling, people will have little choice but to drive alone and increases in public transit will likely not result in similar increases in ridership.

The Bay presents an even more significant challenge with respect to using added roadway capacity to solve extreme congestion events. Unlike roadways on land, the transbay crossings cannot be served by parallel, or frontage, roadways. When a bridge or elevated roadway experiences significant congestion, an accident or an emergency closure, there is no parallel system of roadways to take to make the crossing. In the transbay corridors, this parallel system can be provided by public transit. In the Bay Bridge corridor, the BART system, the ferries and the transbay buses serve as this parallel network. Adding new mixed-flow lanes or bridges would do little to aid regional mobility in extreme congestion events, while parallel public transit corridors could move a significant number of people and provide people with an alternative to the congestion.

Transportation Planning in the Bay Area. Although transportation decisions have a significant impact on the economic health and the quality of life in a region, many residents do not know how these decisions are made or which agency is responsible for which component of the transportation system. Many different agencies and organizations are involved in Bay Area transportation issues, such as the California Transportation Commission, MTC, the congestion management authority (CMA) for each county, BART, the WTA, Caltrain, the Capitol Corridor, CalTrans, AC Transit, Golden Gate Bridge and Transportation District, the Santa Clara Valley Transportation Authority (VTA), the San Francisco Municipal Railway (MUNI), the Transbay Joint Powers Authority as well as a number of non-profit organizations that track transportation projects and advocate for different outcomes in these projects.

The California Transportation Commission was created in 1978 by Assembly Bill 402 in order to consolidate state transportation planning and to make one agency responsible for

developing a single, unified California transportation policy. The Commission has nine members and is responsible for programming and allocating funds for the construction of highway, passenger rail and transit improvements in the California. It also participates in strategies to ensure a source of stable funds for California's transportation needs through the initiation and development of state and federal legislation.

Although the primary responsibilities of California Department of Transportation (Caltrans) are planning, designing, building, operating and maintaining California's 15,000 mile highway system, the role of the agency has changed over time to include new responsibilities. These new responsibilities include overseeing three inter-city passenger rail systems in California, including the Capitol Corridor service in the Bay Area that operates from San Jose to Sacramento. These inter-city rail systems are operated by Amtrak under a contract with Caltrans. Caltrans is also responsible for delivering the state's State Transportation Improvement Program (STIP) and for leading a study on the feasibility of high-speed rail in the state. A significant component of Caltrans work is the actual construction and maintenance of California's roadway and bridge infrastructure, including the seismic retrofit work being done on the Richmond-San Rafael Bridge, the newly constructed Zampa Bridge to replace the Carquinez Bridge, and the Bay Bridge. However, rather than simply focusing on their traditional role as roadway planners and builders, Caltrans has been looking at ways to solve roadway congestion through non-structural solutions and with an emphasis on non-highway transportation. This shift is in response to the recognition that roadways alone cannot move the growing population in the region or solve the congestion problems in California. Caltrans is also looking towards new ways keep the State's people and goods moving that will reduce water and air pollution in California associated with transportation.

The congestion management agencies (CMAs) are responsible for a number of transportation planning activities at the county level. Each urban county must have a designated CMA that develops and updates the Congestion Management Program for that county and monitors the program's progress. This program identifies each county's transportation priorities. CMAs must also set up a performance review process for the transportation network that has been designated by each county. A CMA must also designate service standards for roadways and performance measures for all transportation modes in its county. In addition to these responsibilities, CMAs must also promote alternatives to the single-occupant vehicle through transportation demand management measures which discourage driving alone and establish a program for analyzing the impacts of land use on regional transportation systems, including estimating the cost for mitigating the impacts caused by these land use decisions.

MTC is a 19-member commission responsible for planning, coordinating and financing transportation projects within the nine-county Bay Area. MTC serves two primary roles in planning and funding Bay Area transportation projects. The first is as the State of California's regional transportation planning agency for the Bay Area. The second role is as the agency designated by the federal government to serve as the Metropolitan Planning Organization (MPO) for the region. As the state's regional transportation planning agency, MTC is responsible for developing the Regional Transportation Plan (RTP), which serves as the planning document for almost all transportation projects in the Bay Area, from the seismic retrofitting of the Richmond-San Rafael Bridge to local street improvements. As the MPO for the federal government, MTC identifies the appropriate transportation facilities for meeting the region's needs, concentrating on those projects that will reduce congestion and improve air quality.

In addition to these federal and state functions, MTC also manages many of its own projects, is responsible for administering \$1 of the tolls from the Bay Area's seven state bridges and oversees the long-range planning processes for large, regional transportation projects. Some examples of the projects managed by MTC include a roving tow truck service to clear incidents from congested roadways, the Housing Incentive Program and the Traffic Engineering Technical Assistance Program which provides technical assistance to local governments to aid

them in reducing congestion on local and regional roadways. As for long-range planning projects, MTC has coordinated a number of regional projects, including *the Bay Crossings Study* (completed in 2002), the *Regional Bicycle Master Plan* (completed in September 2001), the *Lifeline Transit Network* (completed in September 2001) and the *Regional Goods Movement Study for the San Francisco Bay Area* (completed in December 2004).

In determining which projects to include in the RTP, MTC must ensure that the projects are consistent with current and reliable data, such as regional land use assumptions made by the Association of Bay Area Governments (ABAG), which are informed by local land use plans. The projects must also be consistent with local land use plans and the appropriate coastal management program (such as BCDC's coastal management program for the San Francisco Bay segment of the California coastal zone). Additionally, MTC analyzes the specific travel route for each proposal and weighs the merits of various options (transit or new roadways or system improvements) and determines which improvements should be incorporated into the RTP and funded by the money that MTC allocates for this purpose.

MTC is required to update the RTP every two years. Although federal regulations require the RTP to be a 20-year planning document, the two-year updates allow MTC to include new projects as the need arises. The RTP includes three funding categories: Committed Funding, Track 1 and Blueprint. The projects that are listed under Committed Funding are those projects that have committed funding attached by law, voter mandate or previous MTC programming actions. Track 1 projects are funded by the monies left over after the committed projects have been funded. The projects listed as Blueprint projects do not currently have funding. These are projects that MTC and the region consider worthwhile for further study or funding, should funding become available. The Blueprint portion of the document is described by MTC as an advocacy document for new transportation revenues to allow the Commission to not only maintain the existing transportation network, but to expand the system to keep up with projected Bay Area population and employment growth.

Although not a transportation agency, BCDC is often involved in regional transportation and land use projects because of the potential impacts of these projects on BCDC's area of jurisdiction. BCDC's involvement in transportation issues began as a response to the number of roadways that had been placed in and around the Bay, often on fill, and the number of projects that were proposed at the time the Commission was created in 1965. The background report for preparation of the Bay Plan identified both the heavy reliance on the private vehicle and the fragmented approach to transportation planning in the Bay Area at that time as significant contributors to region's land use and transportation problems. The report, entitled *Transportation: Surface Transportation on and Around San Francisco Bay*, explains the direct relationship these factors have on the Bay. The report states, "[s]pace-consuming freeway routes that disrupt development and landscape have been politically difficult to locate. Alternatives to freeways receive little consideration because funds for development have been earmarked for highway purposes and technological development of other modes has lagged. The demand for new freeway and highway routes along the Bay shoreline and Bay crossings, the lack of undeveloped open space in which to locate them, and the lack of alternative modes of transportation have caused pressures for the location of routes on the Bay itself." It is for this reason that BCDC works with MTC, Caltrans, ABAG, the WTA and other transportation agencies at both the policy and project level and why the Commission should continue to participate in these projects to ensure that the regional transportation and land use decisions do not result in fill in the Bay or the placement of more roadways and lanes along its shoreline that separate communities from the Bay.

Transportation Trends. In its amendment to the 2001 RTP, MTC describes transportation trends at that time as "[t]ransit trends in the Bay Area are quite similar to national trends. Demand side factors are significant and include personal choice, the economy, patterns of development and the cost of gasoline. The size of the transit fleet, the hours of service and transit operating budgets have all grown at rates exceeding 15 percent, but ridership has not

followed.”⁴ It is important to note that transit trips increased in number and as a share of all Bay Area commute trips between 1990-2000, while the share of single-occupant vehicle trips decreased. Of the ten largest metropolitan areas in the United States, the Bay Area was the only one to see this trend: others saw transit ridership fall or become outpaced by growth in drive-alone trips.⁵ However, despite current trends, the region is projected to grow, as is transbay congestion and ridership on transit-serving transbay routes. How much public transit ridership grows may largely be determined by the transportation and land use decisions that are made in the next decade.

Recent updates to the RTP were completed in December 2001 and in February 2005. The 2001 and 2005 updates demonstrated a shift in priorities for MTC and the region. The two most recent updates to the RTP increase the percentage of funding for public transit and for improving the efficiencies of the existing transportation system. The 2005 update to the RTP has several “firsts” for an RTP document. For the first time, the RTP includes specific policies relating to the importance of transit supportive land uses and describes prioritizing discretionary funding for new transit stations on the presence of existing or planned land uses around new stations that are supportive of transit. The second “first” in the 2005 RTP is the inclusion of money for bicycle and pedestrian pathways.

In the RTP adopted by MTC in 2001, 77 percent of the projected transportation funding was dedicated to public transit, including operations, expansion and rehabilitation. This represented the largest percentage of transportation dollars spent on public transit of any of the metropolitan regions in the nation. In addition to dedicating a majority of the transportation dollars on transit, the 2001 RTP also focuses on utilizing the existing infrastructure more efficiently through better systems management and increasing access to transit and information. The 2001 RTP included several policy initiatives that MTC should pursue to increase transit ridership. These policy initiatives included supporting the legislation to increase the bridge tolls on Caltrans operated bridges to \$3, advocating peak pricing on the Bay Bridge and advocating for a gas tax. The funds of all of these initiatives would be used to pay for increased public transit and act to discourage the exclusive use of the single-occupant vehicle for all trips around the region. During this update to the RTP, MTC also indicated that the next update to the RTP would include land use assumptions that were developed under the Smart Growth Strategy.⁶

In December 2003, MTC adopted a Transportation/Land Use Platform that established a policy to study the conditioning of the allocation of discretionary transit funds under MTC’s control to those local jurisdictions that adopt supportive land use measures around new transit stations. Specifically, MTC included a proposal that it would condition the funds to be spent on approximately 24 new transit expansion projects by prioritizing funding those projects that have land use plans that are supportive of public transit use.

MTC’s 2005 RTP, *Transportation 2030 Plan for the San Francisco Bay Area* (2030 Plan) moves even further away from merely identifying roadways to be funded and the funds that will pay for these roadways. Rather than using ABAG projections based on the adopted land use plans for each jurisdiction, the 2030 Plan is based upon ABAG’s Projections 2003. Projections 2003 is not based upon existing land use planning documents. Instead, Projections 2003 assumes that land uses and densities will change in certain locations and result in a substantial amount of new development in infill areas near transit stations. The densities assumed are a range of 36.1 to 44.9 persons per residential acre in urban areas and 6.1 to 7.3 persons per residential acre in suburban areas. Additionally, the 2030 Plan includes increased funding for the Transportation for Livable Communities (TLC) program and Housing Incentive Program (HIP). The TLC program provides funds for community based transportation projects that increase the transportation options available to communities and make transit more accessible. HIP awards grants to local governments for the construction of new housing near transit stations and

⁴ Metropolitan Transportation Commission. 2001. Regional Transportation Plan.

⁵ 2000 Census.

⁶ Metropolitan Transportation Commission. 2001. Regional Transportation Plan.

corridors. The 2030 Plan also sets aside regional funds for the first time to fill gaps in the bicycle plan network and to improve pedestrian facilities.

Another notable trend in Bay Area transportation is the renaissance of ferry transportation as a way to move people around the Bay. The WTA was established by Senate Bill 916 (Perata), signed into law in 1999. Under SB916 the WTA was charged with developing a plan to increase the network of commuter ferries on the Bay. The plan, *A Strategy to Improve Public Transit with and Environmentally Friendly Ferry System, Final Implementation and Operations Plan* (IOP) was adopted by the WTA in 2003 and identifies new and expanded commuter ferry terminals and routes on the Bay. With its IOP completed and adopted, the WTA is currently implementing the IOP, proposing a new ferry terminal in South San Francisco. The WTA will be phasing ferry service in over time, with a focus on sites in the central Bay that have a source of funding—Berkeley and South San Francisco. More detail on the WTA and its plan for increasing ferry service on the Bay can be found in Chapter 6 of this report and in Figure 1, which depicts the WTA's proposal for increased ferry service.

The Bay Area Commute. Approximately 68 percent of the Bay Area's seven million residents commute to work by driving alone, almost 13 percent carpool, just under 10 percent take transit, approximately three percent walk, a little over two percent travel by some other means and four percent work at home. These percentages, taken from the 2000 census, vary from county to county. The differences in transit usage appear to be generally based on the differences in land use mix and density among the counties and the availability of public transit options. Residential density and the mix of uses in an area, affect the viability and availability of transit options and modes of transportation other than the single-occupant vehicle. As an example, San Francisco County had the highest percentage of transit usage at approximately 31 percent, the highest percentage of people who walked to work at almost 9.5 percent and the lowest percentage of those who drove to work at just over 40 percent. On the other hand, Napa County had the lowest transit usage at just less than 1.5 percent, while Santa Clara County had the highest number of people who drove to work alone at just over 77 percent. As density and land use mix and intensity decrease the number of people who drive alone to work and for other trips increases.⁷ Of the people who take public transit, 40 percent drive, 12 percent carpool, 28 percent take another form of transit and 20 percent walk or bicycle to transit.⁸

Several interesting findings are described in the *Bay Area Transportation State of the System 2003*, compiled by MTC and Caltrans District 4. One finding is that despite the perception of widespread congestion in the Bay Area, MTC estimates that approximately 72 percent of the vehicle miles are traveled at speeds of over 50 miles per hour during peak commute periods. Another interesting set of findings came from the examination of several commutes in the Bay Area. In comparing freeway commutes to public transit alternatives, the freeway alternatives were faster than most of the public transit commutes examined in the study. The Vallejo to San Francisco route provided a big exception, with the ferry rider saving 25 minutes over the solo driver. Those that take BART from Walnut Creek to Oakland saved several minutes over solo drivers for that commute. The Hayward to San Jose trip on Amtrak takes the same amount of time as it takes to drive the trip alone. Caltrain introduced "Baby Bullet" service in 2004, which reduced the train trip from San Francisco to San Jose by 30 minutes. The trip now takes just under one hour and beats driving times in the corridor during even fairly light conditions. For every other commute that was compared for the report, the freeway commute was faster than the public transit alternative.⁹

⁷ Census 2000 Supplementary Survey. San Francisco Bay Area.

⁸ Census 2000. Supplementary Survey. San Francisco Bay Area.

⁹ Metropolitan Transportation Commission and Caltrans, District 4. 2003. State of the System.

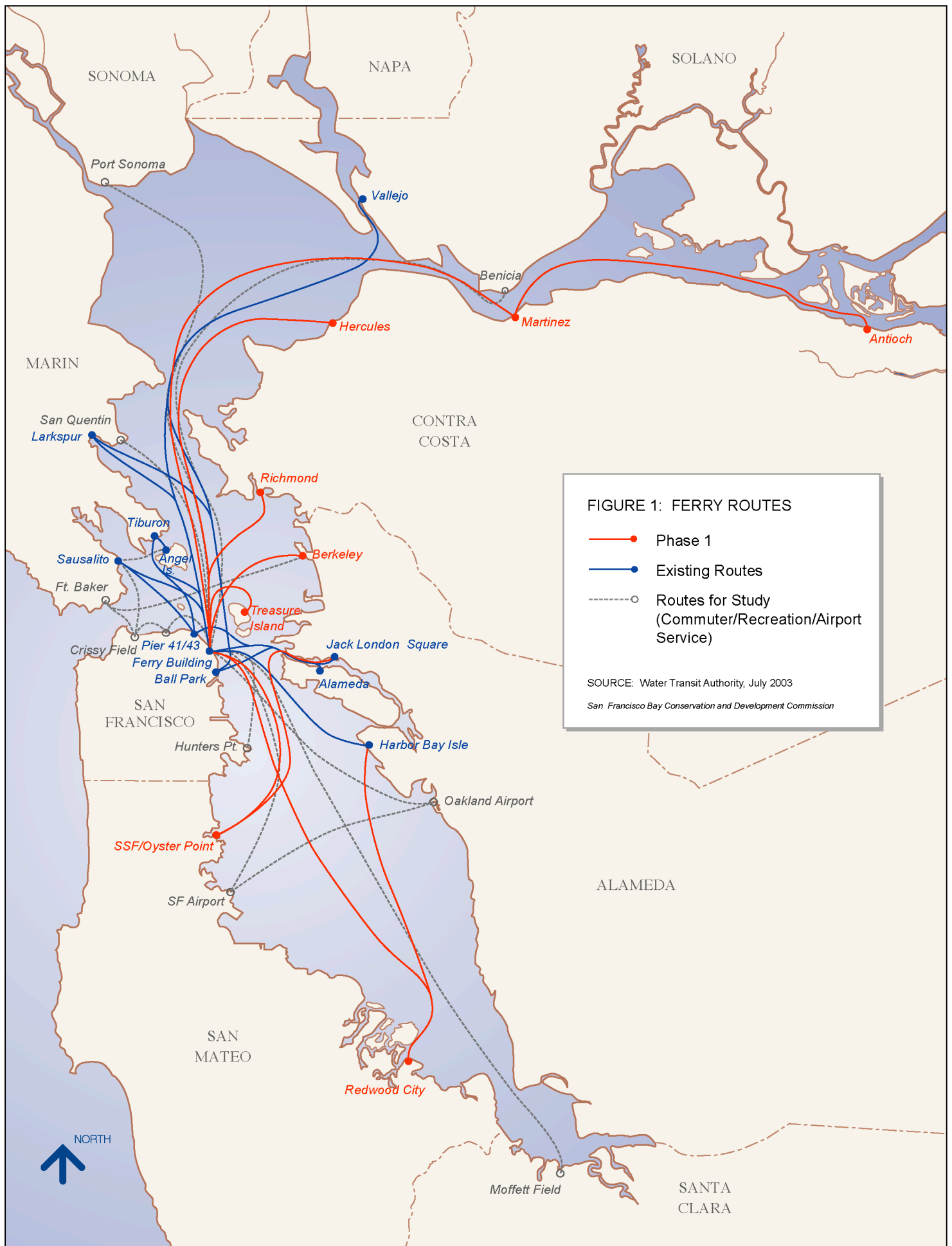


figure 1 back

If public transit is usually not as fast as driving alone, then why do people take public transit in the Bay Area? A survey conducted by RIDES for Bay Area Commuters (the non-profit in charge of operating the Bay Area's Regional Rideshare Program) in 2002 asked people why they took transit to work and found that 19 percent stated they took transit because they did not have a car, 17 percent took transit for comfort/relaxation, 13 percent took transit due to parking constraints and costs, 13 percent took transit because it was more economical for them and 12 percent took transit because it was faster for them than driving alone.¹⁰

Transbay trips account for four percent of all regional trips and almost eight percent of all work trips. Approximately 590,000 people travel the Bay Bridge corridor daily, 109,000 people travel the San Mateo bridge corridor daily, 107,000 travel the Dumbarton Bridge corridor and 119,430 vehicles cross the Golden Gate Bridge. As mentioned previously, transbay travel is projected to increase at a greater rate than non-transbay trips, increasing by 40 percent in the next 20 years.¹¹

The following sections of the report include a discussion of the past and present trends for the range of transportation modes that are available for crossing the Bay and traveling along its shoreline. The discussion includes bridges and roadways, HOV lanes and carpools, HOT lanes, rail, buses, water transit, walking and cycling. The relationship between transportation and land use mix and density are described, including research to indicate that as densities are increased and land uses are diversified, transit usage goes up. Also described in the following sections are the way that transportation and land use trends may affect the Bay and its resources.

¹⁰ RIDES for Bay Area Commuters, Inc.. 2002 Survey.

¹¹ Metropolitan Transportation Commission. 2002. Bay Crossings Study.

CHAPTER 2

RELATIONSHIP BETWEEN TRANSPORTATION AND LAND USE

BCDC's 1968 transportation background report identifies a relationship between transportation and land use. The report states, "[i]n 1967, much if not most of the Bay Area's close-in, readily accessible, readily developable lands have been settled, but the pressures for development continue. Depending upon the choices made, the policies set, the pattern that development will take can be a continuing dispersal without direct order, or the development can be channeled in ways which will make the best use of increasingly scarce land. Transportation policy will continue to be one of the most important factors influencing the direction that future development takes. Policies made concerning land use and settlement patterns will likewise influence the extent and character of the transportation systems and its elements." The 1956 Regional Transit Plan developed for the San Francisco Bay Rapid Transit Commission compared two alternative growth patterns—one dispersed and one concentrated around nucleated centers and sub-centers. This plan found that if the Bay Area developed in a dispersed pattern, then reliance on the automobile would increase, as would congestion on the region's roadways and pressure for more road construction to accommodate this increased congestion. However, if the Bay Area developed around a series of nucleated centers and sub-centers that could be easily served by transit, then the region's reliance on the automobile and the resulting congestion associated with this reliance could be reduced and mobility could be improved for the Bay Area's residents and businesses.¹² Although many regional agencies at the time supported a more concentrated pattern of development for the Bay Area that would reduce reliance on the automobile, the region ultimately developed in a more dispersed way, making many parts of the Bay Area difficult for public transit to serve.

Transit-Oriented Development. Metropolitan transportation planning agencies across the country are tasked with achieving an array of seemingly impossible goals. Not only must they plan for the movement of millions of people and thousands of tons of goods, they must do so in a way that meets air quality standards, is economically sound, responds to the different groups that they serve, and maintains the existing infrastructure while planning for growth in the region. One way these agencies are attempting to address many of the above goals is by linking transportation and land use decisions to allow for the movement of more people by public transit. One of the most popular ideas is transit-oriented development (TOD). The TOD became a major movement in the 1990s and the idea was to place growth in those areas where people would be less dependent upon the single-occupancy vehicle. Peter Calthorpe was one of the first to popularize the TOD and in his book *The Next American Metropolis* he writes about the need to better integrate transportation and land use. Calthorpe defines a TOD as "a mixed-use community within an average 2,000-foot walking distance of a transit stop and a core commercial area. TODs mix residential, retail, office, open space, and public uses in a walkable environment, making it convenient for residents and employees to travel by transit, bicycle, foot or car."¹³

Research has shown that successful transit-oriented development relies on the four Ds—density, diversity, design and distance to transit. These components have been shown to have a strong causal relationship on travel behavior and public transit ridership. For example, studies and models have shown that a doubling in density within a half-mile of a station will normally result in a nearly 60 percent increase in transit boardings. The diversity of land use also has an impact on ridership, with public transit ridership rates at employment centers that have a mix of uses being between five and 10 percent higher than for single-use employment

¹² San Francisco Bay Rapid Transit Commission. 1956. Regional Transit Plan.

¹³ Calthorpe, Peter. 1993. *The Next American Metropolis*.

centers. Neighborhoods around public transit stations that have been designed with a grid system of streets, smaller blocks and for safe and convenient pedestrian and cyclist movement, are associated with public transit usage as much as 20 percent higher than those with typical suburban subdivision design layouts.¹⁴ The distance to transit is a crucial component and studies in the Bay Area have shown that those living near public transit stations are generally five times more likely to commute by public transit than other residents.¹⁵ Do transit-oriented developments really result in people driving less and in a reduction in vehicle miles traveled? For those who live in TOD-like developments in the Bay Area, TOD residents averaged around half of the vehicle miles traveled per year as the residents of suburban subdivisions.¹⁶

In a report sponsored by the Federal Transit Administration entitled *Transit-Oriented Development: Experiences, Challenges and Prospects* the authors sum up the findings of the report by saying, "A considerable body of research shows that under the right conditions, TODs can increase transit ridership and its associated environmental benefits. Research shows that those living in TODs usually patronize transit five to six times as often as typical residents of a region." Other factors that were found to contribute to public transit ridership included the absence of free parking at the destination end of a person's trip, the number of vehicles per household and the concentration of destinations and mix of uses along the entire public transit corridor.

To determine the potential impact of land use decisions on transbay travel over the next 20 years, MTC used the 2020 Central Cities scenario, developed by the Smart Growth Initiative, and determined that this scenario could significantly reduce vehicle trips and increase transit trips. MTC describes the findings in the *San Francisco Bay Crossings Study Final Report July 2002* as "[t]hese large scale land-use changes, compared to currently assumed development trends, reduced transbay travel more than any of the transportation alternatives studied—50,000 fewer daily transit riders than the 2025 baseline." This reduction in transbay vehicle trips is important to BCDC because such a reduction would relieve pressure on existing bridges, eliminating or delaying pressure to place new fill in the Bay for bridges or tunnels. As the transportation background report for BCDC stated in 1968 "[a]s long as freeways remain the primary solution to transportation problems around the Bay, the Bay remains a possible freeway route."

Over the last several years, there has been an increase in the number of projects and proposals that recognize the link between transportation and land use in the Bay Area. The largest in scope is the Bay Area Smart Growth Strategy Project that resulted in a final report in October 2002. This project was led by the region's five regional agencies—the Association of Bay Area Governments, the Metropolitan Transportation Commission, the Bay Area Air Quality Management District, the Regional Water Quality Control Board and BCDC—and included significant input from business leaders, elected officials, environmentalists, community leaders and other interested citizens. The purpose was to identify the ways in which the region could accommodate projected growth, while improving quality of life and preserving the region's natural and cultural resources. The final report makes recommendations regarding housing, infrastructure, open space and transportation. These recommendations include increasing the housing options available to all in the Bay Area, improving urban infrastructure, protecting open space and agricultural lands and reducing dependence on single-occupant vehicles. The report identifies the next step for the project as developing and enacting the fiscal incentives and regulatory changes that are necessary for achieving the recommendations identified in the report.

¹⁴ Transit Cooperative Research Program. TCRP Report 102, *Transit-Oriented Development in the US: Experiences, Challenges and Prospects*. Sponsored by the Federal Transit Administration.

¹⁵ Lund PhD, Hollie, Robert Cervero PhD and Richard Willson PhD. January 2004. *Travel Characteristics of Transit-Oriented Development in California*. Final Report.

¹⁶ Transit Cooperative Research Program. TCRP Report 102, *Transit-Oriented Development in the US: Experiences, Challenges and Prospects*. Sponsored by the Federal Transit Administration

MTC has recently funded several programs that relate to land use, including the Transportation for Livable Communities program and a subset of this program, the Housing Incentive Program. Transportation for Livable Communities provides capital grants for project design and construction for community level projects. Examples of projects include pedestrian and bicycle improvements in Berkeley, improved links between affordable housing to a renovated shopping center, West Oakland BART and downtown in Oakland and a pedestrian oriented plaza to link new mixed use development to the Dublin BART station. The Housing Incentive Program awards capital grants to localities that build high density housing within one-third of a mile of a major transit station or corridor that has peak period service intervals of 15 minutes or less. Examples of these projects include high density housing near bus lines in East Palo Alto, a mixed-use project near bus lines and BART in Daly City, a mixed-use project near a bus line in Berkeley and a transit village adjacent to the BART station in Richmond. Since 1998, the Housing Incentive Program has resulted in \$60 million being awarded to 149 projects and increased the mix and densities of uses within walking distance of transit.

In 2003, MTC went a step further and adopted a Transportation/Land Use Platform which was described previously in this report and established platform for MTC to condition the allocation of discretionary transit funds under MTC's control to those local jurisdictions that adopt transit supportive land use around new public transit terminals, identified by MTC as Resolution 3434 Projects. Table 1 provides a list of the projects that MTC has identified as Resolution 3434 projects. MTC is currently developing a Transit-Oriented Development (TOD) Policy for Resolution 3434 Projects. MTC describes the purpose of the project as:

"MTC is developing a set of policies and programs to improve the integration of transportation and land use in the Bay Area—including a specific policy to condition the allocation of regional discretionary transit funds under MTC's control, provided by Resolution 3434, on supportive land use policies for station area and corridors included in the region's transit expansion program. This policy is designed to improve the cost-effectiveness of regional investments in new transit expansions, ease the Bay Area's chronic housing shortage, create vibrant new communities, and help preserve regional open space. The policy will encourage transportation agencies, local jurisdictions, members of the public and the private sector to work together to create development patterns that are more supportive of transit. Project sponsors shall indicate how they will satisfy the TOD policy requirements as a condition for receiving regional discretionary transit investments under Resolution 3434."

Although much has been done recently to link land use and transportation planning, there are still many barriers to realizing the opportunities that could result from linking these two types of planning. The continued reliance on the automobile combined with the projected growth in the region will increase the pressure on the Bay for fill to build new bridges or tunnels or widen existing infrastructure. For this reason, and because BCDC is one of the five agencies in the Bay Area with a regional perspective, BCDC should continue to participate in projects, forums and decisions that support linking land use and transportation planning. Since many of the land use decisions that are made by local governments are outside of the Commission's jurisdiction, the Commission should focus on regional policy issues and work closely with MTC and other regional agencies to ensure the interests of the Bay and its resources are considered in these processes.

Within the urbanized areas of its jurisdiction and within areas with redevelopment potential, BCDC should consider high-density, mixed-use development that is within walking distance to existing or planned transit. For example, the proposed expansion of the ferry system by the WTA includes new ferry terminals and transit-oriented development surrounding appropriate terminals. BCDC should work with the WTA to support this concept of increasing densities, reducing parking, including a mix of uses and public access. This kind of development would increase access to the Bay and the viability of the ferry system, while

reducing the parking necessary along the Bay shoreline, providing new uses and services to existing communities and increasing the connection that these surrounding communities have to the Bay.

CHAPTER 3

WALKING AND CYCLING

Communities were once designed to be accessible to public transit, with a mix of residential and neighborhood retail linked by walkways and pedestrian promenades. When the predominant mode of travel became the automobile, communities were designed to accommodate cars. The design features incorporated to make automobile travel more comfortable and convenient included large parking areas, wide surface arterial streets, higher speed design on community roadways and a more distinct separation between land uses. While clustering uses together and linking uses with pedestrian and bicycle pathways was good for public transit, walking and biking, these features made it more difficult and slower to travel by automobile. As a result many newer developments often failed to include provisions for walking and bicycling, lacking sidewalks, pedestrian and bicycle pathways. The design of these communities not only made it difficult, but unsafe, to walk or cycle as a mode of transportation or as a form of exercise or recreation. The result of designing communities for automobile movement at the exclusion of all other transportation modes is that fewer people are able to walk or cycle to work, school or for recreation. Currently, people use their automobiles even for short trips of under one mile and people without access to an automobile often lack access to critical community goods and services.

Walking and Cycling for Transportation Purposes. Until recently, there has been a lack of data available to determine the extent to which providing facilities for non-motorized transportation actually resulted in an increase in the number of people who commuted by foot or by bicycle. However, a number of studies and anecdotal evidence indicates that bicycling can substitute directly for automobile trips and that communities that improve cycling conditions often experience significant increases in bicycle travel and related reductions in vehicle travel.¹⁷ The presence of public policy support for non-motorized transportation is also a factor in the number of people who commute by bicycle, with some studies indicating that cycling is five to 10 times higher in communities with supportive policies.¹⁸

One of the first studies designed to determine whether providing non-motorized pathways resulted in increased usage for commute purposes was conducted in 1997 and found that each additional mile of bikeway per 100,000 people is associated with a 0.069 percent increase in bicycle commuting.¹⁹ Research conducted by the North Carolina Highway Safety Research Center found that the presence of pathways that form a continuous network that linked areas of community activity was the most important factor in determining the number of people who bicycled for non-recreational purposes.²⁰ A study of 20 U.S. cities selected to represent a cross section of cities in the U.S. found that distance to work and the perceived safety of the trip were important factors in whether people cycled to work and that people who cycle for errands, school or work prefer to ride on bicycle paths along highways over the grade-separated paths

¹⁷ PBQD. 2000. Data Collection and Modeling Requirements for Assessing Transportation Impacts of Micro-Scale Design. U.S. Department of Transportation.

¹⁸ Comsis Corporation. 1993. Implementing Effective Travel Demand Management Measures: Inventory of Measures and Synthesis of Experience, U.S. Department of Transportation and Institute of Transportation Engineers.

¹⁹ Nelson, A.C. and D. Allen. If You Build Them, Commuters Will Use Them. Transportation Research Record, 1997.

²⁰ University of North Carolina Highway Safety Research Center. FHWA. U.S. Department of Transportation. 1994. A Compendium of Available Bicycle and Pedestrian Trip Generation Data in the United States.

preferred by recreational users.²¹ Another study that analyzed data from 35 large cities in the U.S. found a correlation between the amount of infrastructure available for non-motorized transportation and the number of people who commuted by a non-motorized mode.²² An interesting finding from this study is that the percentage of people commuting by bicycle is significantly correlated with three bicycle infrastructure variables, the most significant correlation being the number of Type 2 bicycle lanes per square mile. The more miles of Type 2 bicycle lanes provided, the more people who commute by bicycle in the city. Results from modeling the data from the 35 cities in the study indicated that for typical cities with populations over 250,000, each additional mile of Type 2 bike lane per square mile is associated with an increase in the share of workers commuting by bicycle of approximately one percent.

The importance of network of continuous pathways designed to connect residential, commercial, and other community activity centers is identified by a number of studies. As the Nelson and Allen study states, "It might be what matters most about the provision of bicycle pathways for commuting is whether they are being designed for commuting."²³ The importance of land use and transportation planning has been identified in several studies which have indicated that more people use non-motorized transportation for non-recreational purposes when planning for these modes is integrated into a region's transit system and land use pattern.²⁴ Simply developing pathways for recreational use and hoping they will serve double duty as commute routes is often not enough. This may explain why cities with approximately the same amount of non-motorized pathway miles can have vastly different percentages for commuting on these pathways. In cities where an effort was made to link activity centers, the amount of people who use non-motorized pathways for non-recreational purposes is higher than in cities that did not design the pathways to connect different land uses.

The federal government has begun to require that the metropolitan planning organizations include bicycle and pedestrian facilities in all transportation improvement programs through the Intermodal Surface Transportation Efficiency Act (ISTEA). The federal government also identified in its National Bicycling and Walking Study the goal of doubling of the share of trips made by foot or bicycle.²⁵

Although BCDC is not a transportation agency, there is one form of transportation that the Commission has been instrumental in securing—public access pathways for walking and bicycling. Since BCDC's creation, an additional 935 miles of Bay shoreline has been opened up to the public. This increased access provides the Bay Area with pathways and amenities to make walking and cycling along the Bay shoreline safer and more convenient, allowing people the opportunity to use those forms of travel for either recreation or transportation purposes.

Walking and biking as a transportation choice or option has been overlooked for many years. The design and street layout of many new communities and public transit stations have not included accommodations for walking and cycling to work, to run errands, to school, to access restaurants, retail or entertainment areas or for recreation. Currently, nine percent of people walk in the Bay Area for all trips, while 3.2 percent walk to work. Walking represents a larger percentage of trips to school, with 20 percent of those trips being made by people on foot. The importance of density, design and land use mix in encouraging walking is illustrated by the percentage of people who walk to work varies from almost 9.5 percent in San Francisco down to

²¹ Goldsmith, S.A. 1992. National Bicycling and Walking Study, Case Study No. 1: Reasons Why Bicycling and Walking Are and Are Not Being Used More Extensively as Travel Modes. FHWA, U.S. Department of Transportation.

²² Dill, Jennifer and Theresa Carr. 2003. Bicycle Commuting and Facilities in Major U.S. Cities: If You Build Them, Commuters Will Use Them—Another Look. Portland State University.

²³ Nelson, A.C. and D. Allen. If You Build Them, Commuters Will Use Them. Transportation Research Record, 1997.

²⁴ Victoria Transport Policy Institute. 2005. Cycling Improvements: Strategies to Make Cycling Convenient, Safe and Pleasant. TDM Encyclopedia.

²⁵ Federal Highway Administration. 1999. National Bicycling and Walking Study Five Year Status Report by the U.S. Department of Transportation.

1.5 percent in Contra Costa County. Bike trips represent approximately 1.2 percent of all trips in the Bay Area. As with walking, cycling represents a larger percentage of trips to school, with four percent of the people making these trips on bicycle.²⁶

Bay Area Regional Systems and Trends. As the studies cited above indicate, walking and cycling trips become much more popular when these modes are supported with safe trails, signage and linkages to larger trail systems and to major origin and destination points. Several examples of this include the expansion of the bike paths in Davis, the provision of the Iron Horse Trail located in the East Bay and the dedication of more space on Valencia Street in San Francisco. In the City of Davis, the provision of abundant bicycle paths has resulted in a significant increase in cycling in the city. Bicycle trips now account for more than 25 percent of all trips taken in Davis.²⁷ The Iron Horse Trail is a multi-use trail that currently links the East Bay communities of Concord and Dublin. When completed, the trail will link Livermore to Suisun Bay for a distance of 33 miles, traveling through 12 cities. The trail also serves as a connection between residential and commercial areas, job centers, park and open space areas, schools, other trails and bus stops and BART stations. In addition to using the trail for recreation and leisure, many are using the trail to access work. Surveys of users have found that approximately 33 percent of those that use the trail do so for purposes other than recreation. While providing a more positive environment for non-motorized transportation is not likely to remove significant numbers of drivers from the region's roadways, it does provide people with a healthy alternative to the automobile, particularly for short trips and provides people who are unable to drive with a safe environment for walking for exercise, errands and other trips. A system of pathways can also enable transit users to leave their cars at home or provide connections to transit for people who are unable to drive by providing safe and convenient access to transit stations. Reducing the number of people who must drive to transit stations also reduces the localized traffic and parking impacts associated with transit stations.

This focus on pedestrian and cycling trails is creating an increasingly positive environment for walking and cycling in the Bay Area, providing people the opportunity to walk or cycle for recreation or transportation purposes. Walking is the most popular leisure activity in the country and studies have shown that one of the most important determinants of whether or not someone is physically active is that person's neighborhood. Factors such as the presence or absence of sidewalks, traffic, topography, lighting, the presence of others, crime level and scenery all play a role in whether a person is active.²⁸ Research by the Center for Disease Control found that people cited two main reasons for being inactive- a lack of pathways and sidewalks and safety concerns.

Another project that illustrates the impact of making areas safe for walking and cycling is the Valencia Street project. The San Francisco Bicycle Coalition worked with the City of San Francisco on a redesign of Valencia Street, a heavily traveled street in San Francisco. The redesign resulted in reducing the number of lanes dedicated for cars from four to two, adding bicycle lanes, a median and dedicated turn lanes. The project has reduced vehicle speeds and significantly increased the number of people who bicycle along the street, from approximately 100 per hour to approximately 200 per hour. The number of automobiles on the street per day has been reduced from 22,200 per day to 19,700 per day. The public response, based on the calls received by the Department of Parking and Traffic on the project, has been overwhelmingly positive.

Many Bay Area residents walk or cycle to work, to BART, buses, trains or ferries. Density and distance is an important factor for these trips. Over 90 percent of walking trips to BART are

²⁶ Census 2000 Supplementary Survey. San Francisco Bay Area.

²⁷ Killingsworth, Richard and Jean Lamming. July 2001. Development and Public Health: Could Our Development Patterns be Affecting Our Personal Health? Urban Land.

²⁸ Ewing PhD, Reid. 2003. Relationship Between Urban Sprawl and Physical Activity, Obesity and Morbidity. Centers for Disease Control and Prevention.

less than one mile in length. In general, walking and cycling are modes used for shorter distances. In fact, 40 percent of all walking and cycling trips are to locations that are less than two miles from the point of origin. Approximately 25 percent of these trips are less than one mile in length.²⁹ Public transit station planners could encourage walking and cycling by reducing the number of parking spaces that are available, by providing bicycle and pedestrian pathways, working to link these pathways to neighborhood and employment centers and by accommodating bicycles either at the stations or on the transit systems.

Many planning and advocacy organizations, including Bay Area bicycle coalitions, the Association of Bay Area Government's Bay Trail project and the Bay Area Ridge Trail Council, have worked hard to ensure that the benefits of trail systems and dedicated lanes are considered when projects are being planned. The Bay Area Ridge Trail is planned as a 400-mile network of trails located along the region's ridgelines. MTC included a regional bicycle plan in its 2001 RTP that provided a framework to identify regional priorities for bicycle routes and facilities. The plan, entitled the *2001 Regional Bicycle Plan for the San Francisco Bay Area*, identifies a system of bicycle routes that, when completed, would both ring and cross the Bay. Figure 2 depicts the MTC's proposed regional bicycle plan which includes bikeways across the entire Bay Bridge span, the Richmond-San Rafael Bridge and the Hayward-San Mateo Bridge. In order to fund the regional bicycle plan, regionally significant pedestrian projects and pedestrian and bicycle projects that serve schools and public transit, MTC created the Regional Bicycle and Pedestrian Program. In addition to support made possible by this program, MTC committed \$200 million dollars in its *2030 Plan* for regionally significant bicycle and pedestrian projects.

The Association of Bay Area Governments is developing a 500-mile network of trails that accommodates both pedestrians and cyclists along the shoreline of the San Francisco Bay. Figure 3 depicts the general alignment of the proposed and existing San Francisco Bay Trail project. The program, the San Francisco Bay Trail project, was created in 1987 by a state bill authored by then state Senator Bill Lockyer. The concept of the Bay Trail is to create a continuous link around the shoreline of San Francisco Bay and to provide access to pedestrians and cyclists across the major toll bridge crossings. As the Bay Trail is designed to provide continuous access to the Bay and along its shoreline, BCDC has worked closely with its staff to meet the project's objective. The Bay Trail is designed to link all nine counties in the Bay Area, 47 of the cities in the region and would cross all of the major toll bridges that cross the Bay. To date, approximately 240 miles of the trail are completed and trail access exists or is planned and funded for the new Zampa Bridge, the Benicia-Martinez Bridge, the Dumbarton Bridge, the Golden Gate Bridge and the eastern span of the Bay Bridge. There is no non-motorized pathway across the San Mateo-Hayward or the Richmond-San Rafael Bridges or the western span of the Bay Bridge. The Bay Trail has made some important connections across major freeway systems, such as Interstate 80 in Berkeley and State Route 92 in Hayward, which has increased access to the Bay for both regional users and the residents of local neighborhoods. The Bay Trail website describes a variety of locations and points of interest that lie within two miles of the planned and existing trail network, including 2.7 million residents, 1.8 million jobs, 57,000 acres of open space, large employers such as Oracle, United Airlines, Lockheed and Genetech, 12 colleges, 21 Caltrain stations, 20 BART stations, eight VTA stations, six MUNI stations, six Amtrak stations, two ACE stations, all ferry terminals and large numbers of bus stops.³⁰

BCDC has been involved in providing public access to and around the Bay's shoreline for over 30 years. A significant provision of the McAteer-Petris Act is the requirement that all projects provide maximum feasible public access to the Bay consistent with the proposed project. This requirement has resulted in miles of public access around the Bay, served to increase regional and local access to the Bay, and provided locations for the Bay Trail. The

²⁹ Cervero, Robert. 1995. *Travel Choices in Pedestrian versus Automobile Oriented Neighborhoods*. University of California Transportation Center.

³⁰ San Francisco Bay Trail website www.abag.ca.gov/bayarea/baytrail/baytrail.html

significant public spaces available at SBC Ballpark, the Tiburon shoreline and the pathways over the Zampa Bridge are a result of BCDC permit requirements.

Although access has greatly improved for walkers and cyclists, many links need to be completed for easy and safe to access. To support and encourage walking and cycling dedicated trails must lead safely and conveniently to places people want to go. In some places, such as the Valencia Street project, that may mean dedicating less space to cars. Elsewhere, both can be accommodated. Often, one of the most significant impediments to creating these linkages is the location of bridge, roadway and rail projects. In the past, these roadways often separated communities from the Bay, from commercial and recreational areas and often split neighborhoods that used to exist as one community from one another. In the more heavily urbanized areas of the waterfront, such as Oakland, Emeryville, Richmond and Berkeley, access to the Bay has been either difficult or impossible due to major transportation infrastructure. Prior to the Loma Prieta earthquake in 1989, public access to San Francisco's waterfront was significantly impeded by the Embarcadero structure that separated downtown from the Bay. Once this structure came down, access to the Bay significantly improved, spurring development along the waterfront and activity along the waterfront. To make the Bay shoreline accessible to the public, transportation project planners need to accommodate multiple modes when designing transportation projects, including roadway, bridge and rail construction and improvements and at new ferry terminals. Tools that can be used to ensure safe public access to the Bay shoreline include traffic calming measures, speed humps, raised crosswalks and intersections, extended and widened sidewalks, marked bicycle paths, grade separated roadways or railway crossings, pathways that are separated from vehicular traffic, mini-roundabouts, widened medians, rumble strips, landscaping, pedestrian and bicycle overcrossings or undercrossings and non-contiguous sidewalks. Such measures encourage walking and cycling by making them both safe and convenient.³¹

³¹ Transportation Alternatives. 2004. Streets for People



Figure 2 back

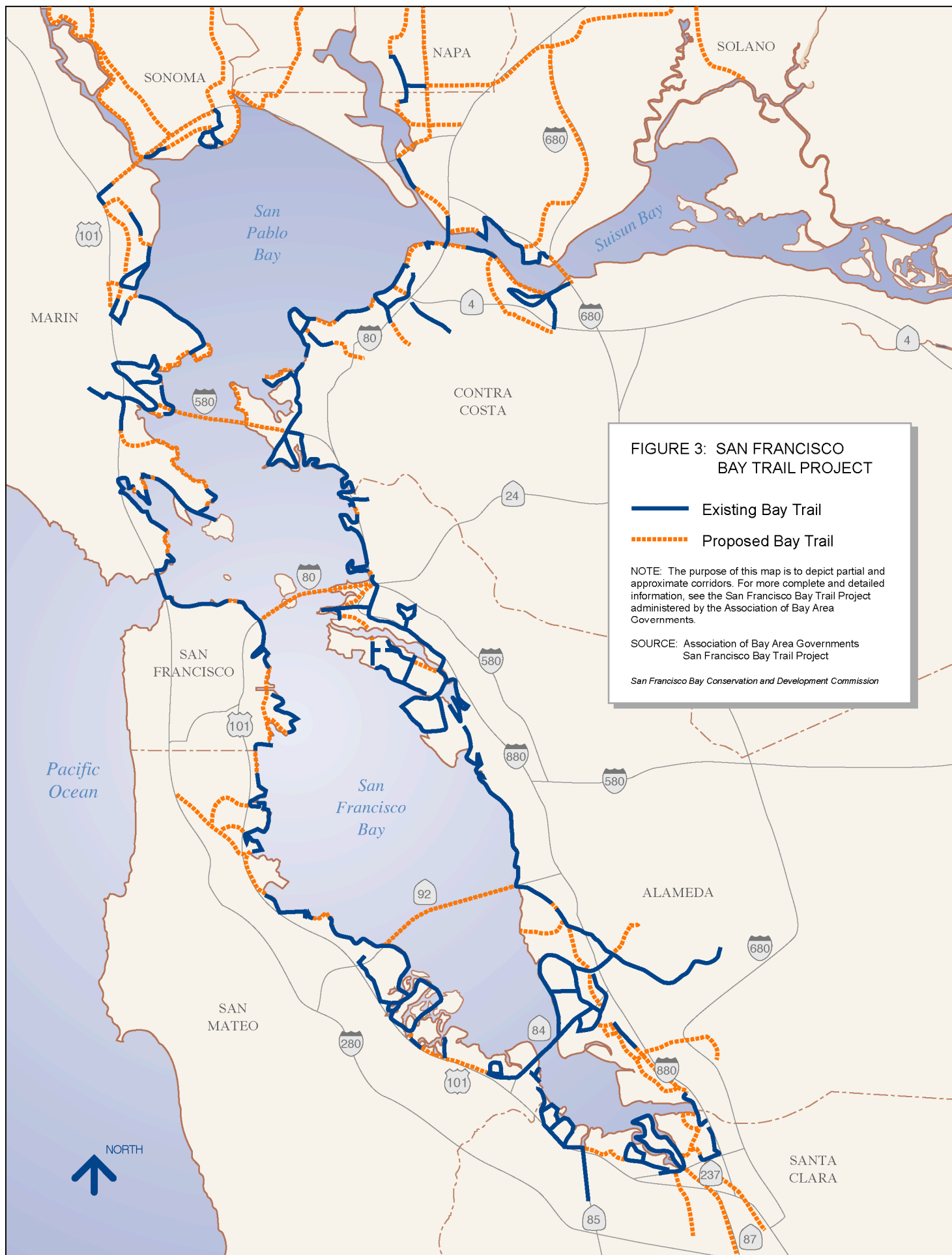


Figure 3 back

CHAPTER 4

BRIDGES AND ROADWAYS

Seven major bridges span the Bay. All of the original spans were completed before BCDRC was established in 1965. The first vehicular crossing of the Bay was the Dumbarton Bridge, completed in 1927. The original Carquinez Bridge was also completed in 1927. The original San Mateo-Hayward Bridge was completed two years later and was the longest bridge in the world at the time it was built. The Bay Bridge and the Golden Gate Bridge were completed in the late 1930's. The last two bridges that were constructed over the Bay were the Richmond-San Rafael Bridge completed in 1956 and the Benicia-Martinez Bridge in 1962. Many of these bridges have been replaced or substantially renovated since the original completion of the spans. A new Dumbarton Bridge was built in 1984, the San Mateo-Hayward Bridge was replaced in 1967 and the Carquinez Bridge was replaced in 1958. The Bay Bridge was renovated in 1958 to remove the inter-urban rail system (the Key System) and increase capacity for automobiles. In every case, the bridge structures were replaced due to increased traffic and for safety reasons. The San Mateo-Hayward Bridge span was originally constructed as a trestle bridge that required the raising of the trestle to allow for shipping traffic approximately six times a day, disrupting automobile traffic.

Building of the Bridges. The building of the bridges over the San Francisco Bay required dedicated politicians and public employees, visionary engineers and brave construction workers and resulted in two of the world's great bridges—the San Francisco-Oakland Bay Bridge and the Golden Gate Bridge.

The design and construction of the Bay Bridge was initiated by the Hoover-Young San Francisco Bay Bridge Commission which concluded in 1930 that the bridge was both necessary to the development of the area and economically and structurally feasible. Rather than one project, the Bay Bridge was designed as four in order to overcome some of the engineering challenges presented by spanning such a long distance and at such a height. The four parts of the project consisted of—two suspension bridges between San Francisco and Yerba Buena Island, a tunnel through Yerba Buena Island and a cantilever span between San Francisco and Oakland. The challenges that the engineers and construction crews faced were formidable and resulted in many firsts. The Bay Bridge was the longest and most expensive bridge ever built, requiring over 6,500 workers to complete the work. The tunnel through Yerba Buena Island was the tallest bore in the world and the foundations for the bridge extended the greatest depths below water of any other structure. One piling was sunk over 240 feet below water. The joining of the two suspension bridges required a solution from the top creative minds in deep-water foundations and resulted in the “Moran-Purcell caisson” which was constructed at a dry dock in Oakland. The caisson was half the size of a city block and consisted of 55 vertical steel cylinders with each cylinder measuring 15 feet in diameter. Despite the engineering and construction challenges, the bridge was completed ahead of schedule and considered a great success.

The Golden Gate Bridge was more politically challenging than the Bay Bridge. Unlike the Bay Bridge, where there was close to unanimous support for the span, many opposed the proposal to span the Golden Gate. Cost and aesthetics were among the primary reasons for opposition and the first designs for the span consisted of railroad trestle-like designs that would have blocked views of the Golden Gate, the Pacific Ocean and the “sunsets”. Concerns over the impact a span would have on the natural beauty of the Golden Gate and its role as the region's gateway resulted in a bridge project that placed equal emphasis on function and design. The outcome was that the engineer and architect on the project designed a work of art that happened to be functional, rather than a utilitarian bridge.

Heralded as the longest single span in the world, the Golden Gate Bridge took four years to complete. Since its completion the bridge has served as a symbol of the Bay Area, is one of the

most photographed manmade structures in the world and has been the inspiration of countless good and bad art—from poetry to movies. It is almost universally agreed that rather than degrade its surroundings, the Golden Gate Bridge honors and improves upon the natural beauty of the site.

Existing Conditions. Currently, the bridges are going through another round of replacement and renovation. The reasons are primarily the same—increased congestion, operational improvements and seismic safety. Although congestion on the bridges increased noticeably in the late 1990s and early 2000s, in 2002 the growth in bridge traffic had slowed. In 2002, the average daily traffic on the Bay Area’s bridges, in the toll direction only was 54,920 vehicles on the Golden Gate Bridge, the Bay Bridge served 136,952 vehicles westbound per day, the San Mateo-Hayward Bridge had 42,010 vehicles cross westbound per day, the Dumbarton Bridge was traversed by 33,009 vehicles, the Richmond-San Rafael Bridge is traveled by 35,878 vehicles and the Benicia-Martinez Bridge had 50,797 vehicles move across it per day in the toll direction.³² The percentage of people who drive alone, participate in carpools or take transit varies for each span. Recent numbers were gathered for the Bay Bridge, the Dumbarton Bridge and the San Mateo-Hayward Bridge as part of MTC’s *Bay Crossings Study*. At the time of the study, in 2000 and 2001, in the Bay Bridge corridor, the percentage of people who drove alone on the Bay Bridge was 34 percent, 35 percent participated in carpools, 27 percent took BART, three percent rode an AC Transit transbay express bus and one percent took a ferry. For the Dumbarton and San Mateo-Hayward bridge corridors, where there are fewer transit options and less dense development patterns, 69 percent drove alone, approximately 30 percent participated in a carpool and one percent took a bus across the Dumbarton Bridge, while less than one percent took public transit on the San Mateo span.³³ The significantly larger number of single drivers on the Dumbarton and San Mateo spans means that these bridges can accommodate fewer people than the Bay Bridge before reaching capacity and becoming congested and indicates that these bridges could be used more efficiently if successful public transit and carpool options could be developed.

MTC’s *Bay Crossings Study* also measured the capacity of these three bridges and counted the number of cars that crossed the bridges. The Bay Bridge has a capacity of approximately 10,000 vehicles per hour and operates at this capacity in the westbound direction during the morning peak period. In the eastbound direction the Bay Bridge is at its capacity of approximately 9,000 vehicles per hour during the evening peak period. The San Mateo-Hayward Bridge had a capacity of 4,000 vehicles per hour at the time of the study and exceeds 3,000 vehicles per hour in the westbound direction between 6 AM and 9 AM and eastbound between 4 PM until after 7 PM. The Dumbarton Bridge capacity is 6,000 vehicles per hour. The bridge does not exceed 4,000 vehicles per hour at any time, while the eastbound direction exceeds 5,000 vehicles per hour between the hours of 5 PM until after 7 PM.

Over the last decade, there have been a number of projects aimed at improving mobility across the bridges and making these structures safer, particularly from earthquake damage. These projects have included the widening of the low trestle portion of the San Mateo-Hayward Bridge to address congestion and enhance safety (completed in 2003), a new eastern span for the Bay Bridge to seismically strengthen the bridge (construction underway), a new Carquinez Bridge (completed in 2004 and renamed the Alfred Zampa Memorial Bridge) and the Benicia-Martinez span that will address congestion, increase the capacity of the bridge by improving HOV lane access and increase safety (construction underway) and improvements to the Richmond-San Rafael and Golden Gate Bridges to seismically strengthen the spans and repair weather and wear damage.

³² Metropolitan Transportation Commission and Caltrans District 4. 2003. Bay Area Transportation State of the System.

³³ Metropolitan Transportation Commission. 2002. Bay Crossings Study.

Public access improvements accompanied many of the projects, increasing bicycle and pedestrian access across the Bay at the Carquinez and Benicia-Martinez crossings and access on the eastern span of the Bay Bridge and along the eastern shoreline of the San Mateo-Hayward Bridge. These projects also raised some issues related to impacts to Bay habitats that had not been previously addressed, including the effects of pile driving on marine organisms, impacts to eelgrass beds and related mitigation issues.

Operational improvements to the spans include increasing and improving HOV lane access to the toll plazas and the implementation of the FasTrak system to allow drivers to pass through the toll plazas without stopping. A recent study has shown that by participating in carpools, commuters in the Bay Bridge corridor can reduce their commute times by up to 20 minutes one way.³⁴ The FasTrak system can allow more than twice as many vehicles to travel through the toll plaza on dedicated lanes as can be accommodated on those lanes where tolls are taken. On the Golden Gate Bridge, 70 percent of the travel during the peak period uses FasTrak. On the Bay Area's seven state owned toll bridges, 37 percent of the people traveling during peak periods use FasTrak.³⁵ Metering ramps are another congestion management strategy that has been gaining use in the Bay Area. Metering ramps control the entrance on to bridges, freeways and roadways to maintain speed and flow and can increase the capacity and efficiency of existing infrastructure are generally far less costly, have fewer negative impacts to ecosystems and communities and can be more quickly implemented than new and widened infrastructure projects.

The Bay shoreline is the location of many of the region's most heavily traveled roadways, including Interstate 80, U.S. 101 and Interstate 880, as well as smaller, but still critical roadways such as State Route 37 in the North Bay and University Avenue, or State Route 109, in the South Bay. There have been past proposals to widen many of the roadways along the shoreline or to build parallel roadways to relieve congestion that would have resulted in Bay fill. Most of these proposals were never realized, while others are still being debated and analyzed. State Route 37 may be widened to four-lanes. This project, including public access and mitigation, is described in detail in the White Slough Development Act the *White Slough Specific Area Plan* and the *North Bay Corridor Study*.

With respect to new and expanded roadways and bridges MTC's draft version of its 2030 *Plan* stated, "Ever since the 'freeway revolt' in the 1960s, the region has been engaged in a long running debate about expanding transportation capacity....Let's begin with a few facts. First, the era of major freeway construction is over. During the next two decades, the Bay Area is expected to spend less on new highway projects than any other large urban area in the country."³⁶

BCDC's Bay Plan policies specifically state that roads are not water-oriented uses and require that any additional bridge proposed across the Bay include "adequate research and testing" to determine if an alternative solution could overcome the particular congestion problem.³⁷ The *Suisun Marsh Protection Plan* also includes findings and policies that discourage roadways in the marsh. The plan states,

"New roadways (highways, primary and secondary roads) and rail lines that form barriers to movement of terrestrial wildlife should not be constructed in the Suisun Marsh or in adjacent uplands necessary to protect the Marsh except where such roadways and rail lines are necessary in the secondary management area for the operation of water-related industry and port uses

³⁴ Metropolitan Transportation Commission and Caltrans District 4. 2003. Bay Area Transportation State of the System.

³⁵ Metropolitan Transportation Commission website. June 2005. Agencies Team up to put Bay Area Motorists on FasTrak.

³⁶ Metropolitan Transportation Commission. 2005. Transportation 2030 Plan for the San Francisco Bay Area.

³⁷ San Francisco Bay Conservation and Development Commission. San Francisco Bay Plan.

within the area designated as a water-related industry reserve in the Protection Plan at Collinsville. Rail access to serve the water-related industrial reserve area may be permitted within the existing Sacramento Northern Railroad right-of-way or along the east side of the Marsh, whichever route would result in the least disturbance to wetlands and wildlife. Wherever possible, rail access to the Sacramento River and through the area designated as a water-related industrial reserve area should be located above the 10-foot contour in order to avoid adverse impacts to wetlands. Whenever the reconstructed line would pass through wetland areas, it should be constructed on trestles.”

Although it is important to identify the policies that pertain to the Suisun Marsh, this report is written to support an amendment to the Bay Plan does not include changes to the *Suisun Marsh Protection Plan*.³⁸

Given the impacts to the Bay from additional roadways and bridges, the environmental, social and economic costs of these structures and the Commission’s existing policies that prohibit roadways and discourage additional bridges, transportation planning and policy making for the Bay Area should place the focus of future work on increasing the efficiency and capacity of the existing transportation and public transit infrastructure, while continuing to provide a policy framework to allow for new bridges to be built. The following sections describe the possible alternatives for increasing mobility across the Bay without expanding or building new roadways or bridge structures.

Express Buses, Carpooling, High-Occupancy Vehicle (HOV) Lanes. Currently there are approximately 300-lane miles of carpool or high-occupancy vehicle (HOV) lanes in the Bay Area. This is a significant increase over the amount of HOV lane miles in 1990, when there were just 64-lane miles. In addition to the expanded amount of lane miles, there are also four bridge toll plazas that have lanes dedicated to carpools and high-occupancy vehicles, as well as 66 on ramps that allow carpools and high-occupancy vehicles to bypass metering lights. Figure 4 depicts the existing and proposed HOV lane network. Many of the lanes are on roadways and bridges within or near BCDC’s jurisdiction, such as the HOV lane on Interstate 80 through Emeryville and those on the toll plazas of the bridges.³⁹

These lanes, known as carpool lanes, HOV lanes or diamond lanes, serve several modes of transportation, including automobiles with 2+ or 3+ occupants, vanpools, shuttles, motorcycles, certain hybrid vehicles and buses. Carpooling is the second most popular transportation mode used to get to work in the Bay Area, with 13 percent of commuters participating in carpools. Carpool requirements in the Bay Area require two or more occupants in the more suburban areas such as Santa Clara and Contra Costa counties and three or more occupants in the more urban areas such as the Bay Bridge and Interstate 80 through Berkeley and Emeryville. Commuters using the HOV lanes in the region benefit from significant time savings over those that drive alone. For example, in Sonoma County, carpools using the HOV lanes save approximately 15 minutes over people driving alone in the mixed-flow lanes. In the South Bay commuters in the HOV lanes save approximately 40 minutes traveling south along the Interstate 880 corridor from Whipple Avenue. The transbay HOV lanes save people time as well. Carpools and buses that use the HOV lane leading to the Bay Bridge in the morning save approximately 20 minutes over those drivers in the mixed-flow lanes. Those traveling west in the morning in the HOV lanes to the Dumbarton Bridge save approximately 20 minutes as well.⁴⁰

³⁸ San Francisco Bay Conservation and Development Commission. Suisun Marsh Protection Act.

³⁹ Metropolitan Transportation Commission. 2002. High-Occupancy Vehicle Lane Master Plan.

⁴⁰ Metropolitan Transportation Commission and Caltrans District 4. 2003. Bay Area Transportation State of the System.

HOV lanes can increase the efficiency with which roadways are used by increasing the number of people that are carried within each vehicle. The carpool lanes along the Interstate 80 through Alameda and Contra Costa counties and a carpool lane along the US 101 in Santa Clara County move more than 4,500 people per hour in the AM peak period. At peak periods during the morning commute westbound over the Bay Bridge, the HOV lanes carry nearly two thirds of all people traveling westbound while carrying only 40 percent of the automobiles during the same period. The Caltrans performance standard for carpool lanes is 1,800 people per hour and the majority of the Bay Area's HOV lanes achieve this standard in the peak travel period and direction. In off-peak directions many of the HOV lanes fall below the Caltrans performance standard, but are projected to meet it within the next decade.⁴¹ Expansions of the current HOV lane miles are already planned by MTC, with 230 lane miles included in the 2001 RTP.⁴²

When used by buses, HOV lanes can significantly increase the number of people being moved per hour. Currently, there are no bus-only lanes in the Bay Area, but there are several areas in the country that have bus-only lanes and, under the appropriate circumstances, such lanes can be very successful. In New Jersey, a bus-only lane carried more than 20,000 people per hour into the Lincoln Tunnel during the mid-1990s, moving more than the combined total of the remaining 12 mixed-flow lanes.⁴³ Even without bus-only lanes, access to HOV lanes is critical to the success of express buses, providing passengers with a time incentive to driving alone. People who travel over the Bay Bridge on AC Transit transbay buses save approximately 15 minutes off of their morning commute due to the time the bus saves by traveling in the HOV lane.⁴⁴

The Bay Area has a number of express bus services that are managed by a variety of agencies. The transit agencies that provide express bus service over the Bay are AC Transit, Golden Gate Bridge and Transportation District and Santa Clara Valley Transportation Authority. Additionally, a consortium of transit providers operate express bus service in the Bay Area, including AC Transit, BART, Union City Transit and the Santa Clara Valley Transportation Authority which provides a transbay bus line over the Dumbarton Bridge. All five major central bay bridges have transbay bus service, although service varies significantly. The Dumbarton, San Mateo-Hayward, and Richmond-San Rafael bridges are served by only one bus-line. The Bay Bridge is served by 22 transbay lines and the Golden Gate Bridge is served by 25 transbay lines. On the Bay Bridge, three percent of weekday trips or 15,200 people per day travel over the bridge on AC Transit buses. Many of the transbay buses also link to other transit, such as BART and Caltrain.⁴⁵ The proposed Transbay Terminal in San Francisco will link transbay buses to more than seven different transit options, including Caltrain and MUNI.

Express buses provide a number of benefits to the region, including the ability to be adaptable to changing development patterns in a way that is not possible with fixed rail or even ferries. Express buses use the existing infrastructure more efficiently and increase its capacity. If

the region had a complete network of HOV lanes, express bus service would likely be more attractive to commuters. The Bay Area Transportation and Land Use Coalition (BATLUC) report on regional transportation includes the creation of a regional web of express buses as one of its key recommendations for creating a world class transit system. In its report *World Class Transit for the Bay Area*, BATLUC recommends using the existing and proposed network of HOV lanes in the region as "the backbone of an express bus web, making the most efficient use

⁴¹ DKS Associates. 2002 High-Occupancy Vehicle Lane Master Plan Update Final Summary Report prepared for the Metropolitan Transportation Commission, Caltrans District 4 and the California Highway Patrol Golden Gate Division.

⁴² Metropolitan Transportation Commission. 2001 Regional Transportation Plan.

⁴³ Leman, Christopher. August 1994. Re-thinking HOV-High-Occupancy Vehicle Facilities and the Public Interest. Chesapeake Bay Foundation.

⁴⁴ Metropolitan Transportation Commission. 2002. High-Occupancy Vehicle Lane Master Plan.

⁴⁵ Metropolitan Transportation Commission. 2002. Bay Crossings Study

of [existing resources].” The report identifies successful express bus webs in Pittsburgh, Pennsylvania, Miami and Ottawa as examples of how the Bay Area could benefit from such service.⁴⁶

In the Bay Area, AC Transit is analyzing bus rapid transit for the region, through the East Bay Bus Rapid Transit (BRT) project. AC Transit has already initiated bus rapid transit along San Pablo Avenue in seven cities, including Berkeley and Oakland and is looking at other locations to extend bus rapid transit service. The San Pablo Avenue BRT has been very successful, increasing ridership by 66 percent during peak periods over the former Limited service. In addition to tripling ridership, the San Pablo Avenue BRT has also resulted in a time savings of 30 percent over the local service along San Pablo Avenue and a 17 percent time savings over the Limited service. BRT is more than a bus line that makes fewer stops like existing Limited service for commuters. BRT incorporates many of the same elements that are associated with light rail, such as electronic bus arrival displays, buses with low floors and more doors to speed passenger ingress and egress, shelters to provide comfortable waits, more frequent schedules and technology that coordinates signal lights to stay green a little longer or turn green a little sooner to give the buses priority. These factors significantly reduce trip time, increase passenger comfort and make travel by bus more attractive. In a recent passenger survey, it was found that approximately 19 percent of current BRT riders formerly drove. The convenience and time-savings associated with San Pablo Avenue’s BRT service has resulted in a reduction of 1,100 automobile trips per day along San Pablo Avenue.⁴⁷ Bus Rapid Transit is also being studied in key corridors in San Francisco and Santa Clara counties.

The majority of HOV lanes in California have been constructed as new lanes, rather than converted from existing lanes. This is likely to continue even though converting an existing lane can provide a wider range of benefits over adding a new lane. Some of the benefits of converting an existing lane include: more cost effective, fewer environmental and community impacts, more likely to result in people shifting peak period trips to public transit, contribute to air quality improvements. However, it is hard to attain public acceptance for converting existing mixed-flow lanes to HOV lanes. Additionally, transportation agencies that have modeled this kind of conversion have found in most cases that when existing lanes are converted to HOV lanes, the congestion on the remaining lanes will significantly degrade traffic flow in the remaining mixed-flow lanes, making it harder for people to get around the region. MTC’s modeling shows that among the HOV alternatives that were studied, vehicle hours of delay are highest when existing lanes are converted to HOV lanes.⁴⁸ However, this increased congestion could ultimately increase transit ridership and car and van pool participation in the long term. In fact, MTC’s model showed that regional transit ridership would be highest when general lanes are converted to HOV with express bus service.⁴⁹

A significant concern that both environmentalists and transit proponents have regarding the construction of new HOV lanes is that there is pressure to convert these lanes to general use when they perform poorly and do not meet Caltrans established standards for vehicles per hour and productivity. The conversion of lanes built for HOV use to unrestricted use can result in an increase in the number of people who drive alone, a decrease in public transit ridership and a degradation of air quality.⁵⁰ For all of the reasons described above, it is important to carefully review HOV lanes that are proposed as newly constructed lanes and to identify those impacts that could result from those lanes being converted to mixed-flow lanes at a future date or to identify ways to address low performing HOV lanes that will ensure that these lanes are not

⁴⁶ Bay Area Transportation and Land Use Coalition. January 2000. World Class Transit for the Bay Area.

⁴⁷ Alameda Contra Costa Transit District website. 2005.

⁴⁸ Metropolitan Transportation Commission. 2002. High-Occupancy Vehicle Lane Master Plan.

⁴⁹ Metropolitan Transportation Commission. 2002. High-Occupancy Vehicle Lane Master Plan.

⁵⁰ Bay Area Monitor. “Carpool Lanes: The Love-Hate Relationship,” in November/December 1999 issue by Leslie Stewart.

converted to mixed-flow use. One possible tool to improve the performance of HOV lanes is the inclusion of High-Occupancy Toll (HOT) lanes within the HOV network. HOT lanes allow people who do not meet the HOV criteria to pay a toll to access these lanes. Allowing people to buy into the lanes could also make it possible to convert existing HOV lanes that only require two passengers into HOV lanes that require three passengers without the likely underperformance of the HOV 3+ lane that is often associated with this conversion. An HOV / HOT combination may also allow for an extension of the hours in which the HOV lanes are operated, requiring a toll or three people per automobile during congested periods on weekends and evenings.

High-Occupancy Toll (HOT) Lanes. As mentioned above, one strategy for getting better performance out of HOV lanes is to allow people who do not meet the HOV criteria to buy into HOV lanes by paying a toll. This strategy, known as High-Occupancy Toll (HOT) lanes, is gaining recognition and some support in the Bay Area. HOT lanes are HOV lanes that allow automobiles that do not meet the posted HOV requirements to pay a toll to enter the lanes. HOT lanes are operated electronically using existing FasTrak technology, with no toll booths to pass through. The amount of the toll varies throughout the day and responds to the congestion conditions in the HOT lanes to ensure that the traffic in the lanes is moving smoothly. The concept is that people willing to pay a toll can use the excess capacity of HOV lanes. Although the Bay Area does not currently have any lanes that operate as HOT lanes, there are several proposals for pilot or demonstration projects and MTC highlights the concept in the *2030 Plan*. Figure 4 depicts MTC's proposed HOT lane network for the Bay Area. Southern California has been successfully operating two HOT lanes, Interstate 15 in San Diego County and State Route 91 in Orange County, for a number of years now. While the concept is gaining momentum in the Bay Area, it is a controversial idea and many have concerns with converting existing HOV lanes to HOT lanes and with establishing new HOT lanes in the region. The Bay Area's first HOT lane will be a demonstration project, known as the Sunol Grade HOT lane, will be located on Interstate 680 between Pleasanton and Milpitas and is being developed by the Alameda County Congestion Management Agency.⁵¹

Supporters and those who think that the region should test HOT lanes say that these lanes could improve the efficiency with which we use our current infrastructure, make existing HOV lanes more successful by increasing the number of cars that can use them, contribute transportation money that could be spent on completing the HOV network in the Bay Area, raise money to fund express bus service that could also benefit from a completed HOV network and provide people with another alternative to improve their mobility.⁵² MTC's *2030 Plan* describes HOT lanes as an innovative way to raise funds for the completion of the Bay Area's HOV lane network and to expand express bus service. The plan states, "[e]xisting HOV lanes would be converted to HOT lanes. Toll revenues could then be used to complete the HOV system, build HOV lane connectors at major interchanges, and expand express bus and rideshare services." The *2030 Plan* also says that the implementation of a HOT lane network could take place over the next five to 10 years, rather than the more than two decades they project it would take to complete the HOV lane network through traditional funding sources.⁵³ Proponents of HOT lanes argue that the conversion of underperforming HOV lanes to HOT lanes can save existing HOV lanes from being converted to mixed-flow lanes by increasing the

⁵¹ Alameda County Congestion Management Agency. Fall 2003 Newsletter. Hot Lanes. New Solutions for Traffic Relief.

⁵² Poole Jr., Robert W. August 2002. New Research on HOT Lanes. Reason Public Policy Institute.

⁵³ Metropolitan Transportation Commission. 2005. Transportation 2030 Plan for the San Francisco Bay Area.

number of people that can use the lanes. If converted to mixed-flow lanes, the benefits of carpool participation and express bus service would be eliminated, which would reduce the number of people that could be moved in the corridor efficiently and increase congestion. In its report, *World Class Transit for the Bay Area* BATLUC identifies allowing single-occupancy vehicles to pay a toll to access underperforming HOV lanes to keep these lanes from being converted to mixed-flow lanes and adjusting that toll as congestion rises to ensure that the HOV lanes flow smoothly. HOT lane supporters also identify the benefits of congestion pricing, which encourages those that have the option to shift their travel times or change their travel modes and reduces congestion during peak periods.⁵⁴ While congestion pricing on the existing bridge structures has consistently failed to gain the support of the Bay Area's policy makers and residents, the provision of a choice to either use the HOT lanes or not may make congestion pricing more appealing when applied only to these lanes. One of the key factors that was cited by San Diego County residents in response to a survey on opinions of the HOT lane in their region was the fact that the tolls were optional. Rather than a toll road or a toll bridge that requires that everyone on the roadway pay a toll or an increased price, HOT lanes provide people with a number of options. The options—to carpool and use the lanes for free, ride the express bus, pay a toll to use the HOT lane or to stay in the mixed-flow lanes—are available to those traveling within these corridors and congestion pricing establishes the appropriate price for ensuring that the HOT lanes continue to move freely.⁵⁵

Opponents of HOT lanes often contest the idea that the option to use the HOT lanes is equally available to all users of the roadway. The basis for this argument is that people with fewer economic resources will not be able to benefit from HOT lanes and that the lanes will disproportionately benefit those in the upper middle class. HOT lanes are often referred to as Lexus lanes to denote what some feel are the elite nature of these lanes. However, while research conducted on the existing HOT lanes in California has shown a relationship between income level and frequency of HOT lane use, this research has also shown that all other income levels also use these lanes. MTC's *2030 Plan* includes a discussion of this relationship stating, "[a] California Polytechnic University (San Luis Obispo) study of Orange County's State Route 91 toll lanes found that only about one-quarter of the motorists in toll lanes at any given time are higher-income motorists." Although the study, entitled *Continuation Study to Evaluate the Impacts of the SR 91 Value-Priced Express Lanes: Final Report* does show that the likelihood that a commuter chooses the HOT lane increases with income level, a range of income levels use the lanes.⁵⁶

The San Diego Association of Bay Area Governments (SANDAG) conducted a study of the HOT lane on Interstate 15 in San Diego County. The study, entitled *I-15 Managed Lanes Value Pricing Project Study* consisted of a series of polls, surveys and stakeholder interviews. The study surveyed the general population of San Diego County by telephone and also conducted more focused interviews of people who participated in carpools or paid to use the HOT lane, people who traveled in the corridor and those who used public transit. The purpose of the study was to obtain information regarding the regional perceptions and experiences of the HOT lanes on Interstate 15. The study found that although people expressed concern about the equity of the HOT lanes, as they became informed about the project those equity concerns were eliminated for approximately 85 percent of people involved in the focus groups, 92 percent of transit riders and carpool participants and approximately 75 percent of the people in the telephone poll. The

⁵⁴ Poole Jr., Robert W. and C. Kenneth Orski. Building A Case For Hot Lanes: A New Approach To Reducing Urban Highway Congestion. Policy Study No. 257. Reason Public Policy Institute.

⁵⁵ San Diego County Association of Governments. 2002 San Diego Association of Governments I-15 Managed Lanes Value Pricing Project Planning Study.

⁵⁶ Cal Poly State University. December 2000. Continuation Study to Evaluate the Impacts of the SR 91 Value-Priced Express Lanes. Final Report.

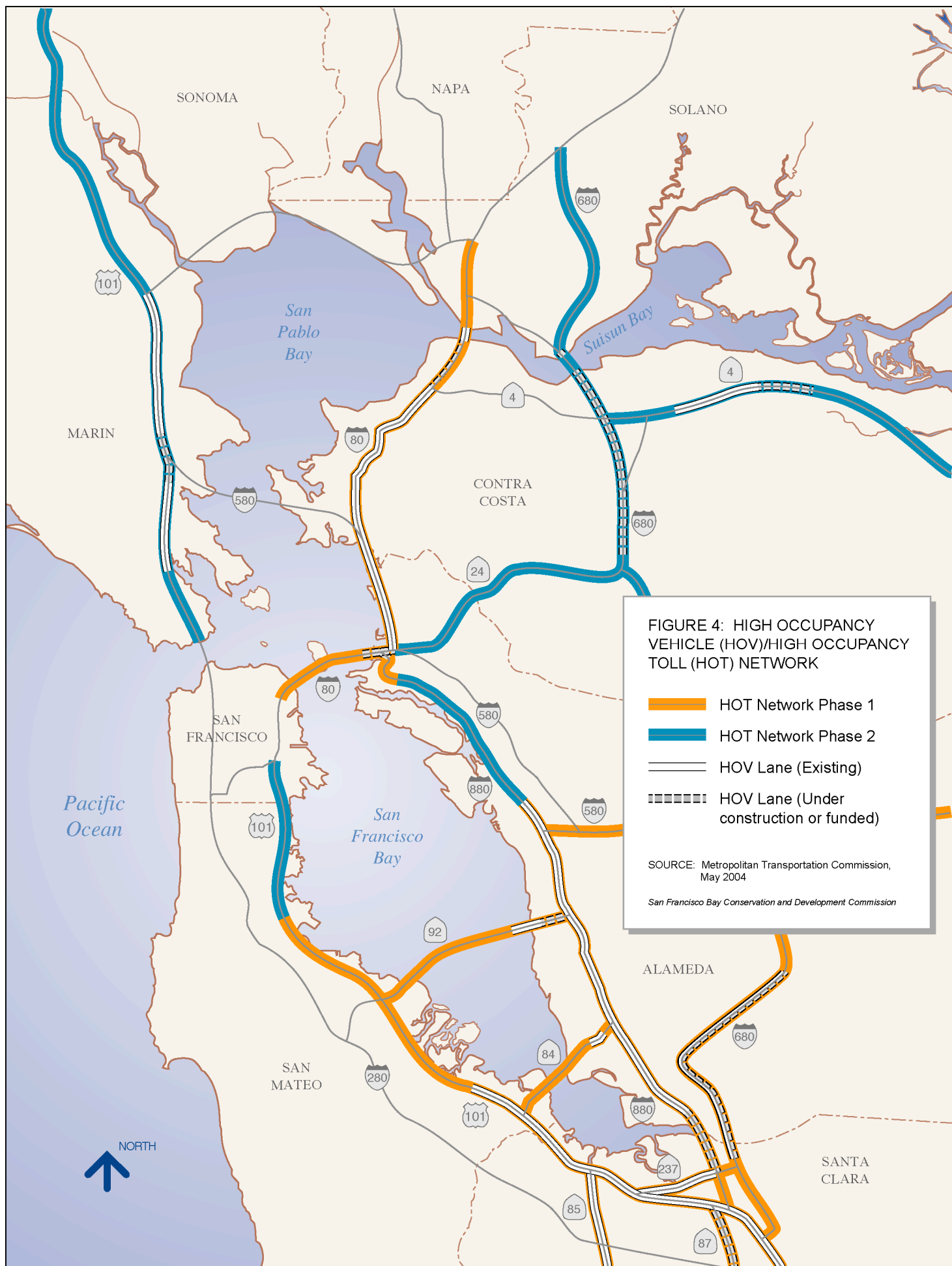


Figure 4 back

equity concerns were addressed by several components of the project. One of the most important components relating to equity is that the tolls raised on the HOT lanes are used to subsidize express buses that also use the lanes. People also liked that the lanes provided an additional “option” that would not otherwise exist and that they were available to a variety of users—carpools, single drivers that pay a toll or express bus riders—and that people could choose to use them based upon their circumstances. The fact that the lanes also eased congestion for those that remained in the mixed-flow lanes was also considered important. One of the most interesting recommendations that came out of the focus group discussions was the idea to permit a moderate degradation of service in the HOT lanes in order to spread the benefits of the project to a wider number of people. The idea is that tolls could be lowered to allow more people in the lanes at peak periods. While this would degrade the level of service on the HOT lanes to about 45 miles per hour, the people in the focus group generally agreed that this was acceptable because it would open up the benefits of the HOT lanes to a wider group of people.⁵⁷

In the context of Bay Area transportation, HOT lanes could be used to achieve several objectives. These objectives include completing the network of HOV lanes around the region, increasing the use of underperforming HOV lanes, allowing the region to shift HOV lanes that currently allow two passengers to HOV lanes that require three or more passengers without the resulting underperformance of these lanes and making the HOV lanes 24 hour lanes without the resulting underperformance of the lanes. HOT lanes, by completing the HOV network and providing a revenue source for express bus service, could attract more people to take express buses. The completion of the HOV network could also attract more people to form carpools. If these shifts from single-occupant vehicles to express buses and carpools were to result from a complete network of HOV lanes, then the pressure on the Bay for additional transportation infrastructure could be reduced, as these shifts would increase the number of people that can be moved on the existing infrastructure. However, if these lanes are proposed as new lanes, rather than conversions of existing mixed-flow lanes, then it is possible that there will be pressure to locate these lanes in the Bay’s shoreline and on fill in the Bay. New, rather than converted, HOV lanes also may increase this pressure. Converting an existing lane to an HOT lane may be more successful than converting an existing lane to an HOV lane, as the underperformance and resulting congestion on the remaining mixed-flow lanes would not be as significant on HOT lanes since more people would have access to a HOT lane. The equity issues associated with HOT lanes could be addressed by the components of the proposed projects, including using the tolls raised by the lanes to fund express service, providing reduced fares for lower income users or reducing tolls and allowing a reduced level of service to permit more people to use the lanes.

Bridges and Roadways in BCDC’s Jurisdiction. Although it is difficult to determine the types of bridge and roadway projects that may be proposed within BCDC’s jurisdiction in the next 20 years, MTC’s Regional Transportation Plans for 2001 and 2005 provide an indication, as do some of the recent projects that have been reviewed by the Commission. In order to accommodate increased growth and traffic volumes and address safety concerns, improvements around intersections and bridge approaches are likely to be proposed within the next 20 years. Improvements to State Route 37 may be proposed in order to address increased congestion on this East-West corridor in the North Bay. The *North Bay Corridor Study* analyzed the congestion in the North Bay and identified a number of interchange solutions further north of State Route 37 that could address some of the congestion and safety concerns in this area. This study also included a variety of recommendations for increasing the efficiency of State Route 37 while improving the public access opportunities and the habitat areas around the roadway. The western approach to the Dumbarton Bridge has been studied and the solutions to the congestion and community impacts that are a result of the current approach may mean a

⁵⁷ San Diego County Association of Governments. 2002 San Diego Association of Governments I-15 Managed Lanes Value Pricing Project Planning Study.

proposal for a project within the Commission's jurisdiction. Seismic and safety work on bridge and pile-supported roadway structures are likely to continue. The Commission has permitted a number of these seismic projects for all of the bridges that span the Bay and is now beginning to see some of the bridges and pile-supported roadways that span smaller waterways or are located in the Bay shoreline. Some proposals to complete the Bay Area's HOV lane network may be located within the Commission's jurisdiction.

The Impacts of Bridges and Roadways on Bay Resources. In addition to the direct impacts that bridges and roadways in the Bay and along its shoreline, such as the elimination of sensitive habitats, the potential for interfering with priority use areas, the fragmentation of public access and habitats and the elimination or degradation of visual access, there are several unique impacts that these projects can have on Bay resources.

Pile-Driving Impacts. Underwater sound and its effects on aquatic organisms have been gaining more attention in recent years. The adverse impacts of sounds of high intensity or of long duration on terrestrial organisms have long been recognized and noise is evaluated in environmental documents and included in planning documents, with contours measured and limits set for what is acceptable and safe for sensitive receptors such as schools, hospitals, residential neighborhoods and areas of biological significance. As a report compiled by the Office of Naval Research stated, "[s]ounds of high intensity and/or long duration are known to cause physiological effects on auditory systems of terrestrial mammals and birds and there is evidence that such sounds can effect the ears of fishes."⁵⁸ The report states further that "[t]he effects of intense sound on the hearing of aquatic animals is not well known and has only been minimally investigated to date. However, there is evidence that temporary and permanent hearing loss occurs in dolphins and some pinnipeds, as well as in at least one species of fish."⁵⁹ In addition to hearing loss, aquatic organisms can suffer other impacts resulting from human-generated noise in the marine environment of high intensity and/or of long duration, including impacts to the swim bladders of fish that can cause changes in behavior, and instant or delayed mortality.⁶⁰ It has also been observed that human-generated noise can result in avoidance and flushing behaviors, so that work done near important foraging, breeding and nursing areas could have greater impacts than in other areas.

Pile-driving has the potential to impact marine mammals traveling through the Bay and at haul out and pupping sites. There is concern that pile-driving may result in deafness or disorientation in marine mammals and may cause marine mammals to leave the Bay or abandon existing haul out and pupping sites. Whales, which are somewhat rare in the San Francisco Bay, are more sensitive to these sound wave impacts than the more common species in the Bay such as sea lions and harbor seals. However, whale sightings have been increasing in recent years, with numbers nearing historic numbers once found in the Bay. Hearing and echolocation abilities can be impacted at 180 decibels. The National Marine Fisheries Service considers that underwater levels of 190 decibels and above could cause temporary hearing impairment in harbor seals and sea lions and in whales at 180 decibels and above.

The effects of human-generated noise in the Bay gained a great deal of attention when the driving of large, steel piles for the Benicia-Martinez Bridge resulted in a significant number of fish kills. In 2000, pile-driving work in Canada also resulted in killing significant numbers of fish.⁶¹ A ferry terminal project in Puget Sound that included the impact driving of 24-inch steel

⁵⁸ Gisiner, Ph.D., Robert C., February 1998. Workshop on the Effects of Anthropogenic Noise in the Marine Environment. Marine Mammal Science Program. Office of Naval Research.

⁵⁹ Gisiner, Ph.D., Robert C., February 1998. Workshop on the Effects of Anthropogenic Noise in the Marine Environment. Marine Mammal Science Program. Office of Naval Research.

⁶⁰ Daily Journal of Commerce, Portland, Oregon. June 3, 2004. Fish Kills Drive Techniques for Placing Bridge Piles.

⁶¹ Daily Journal of Commerce, Portland, Oregon. June 3, 2004. Fish Kills Drive Techniques for Placing Bridge Piles.

piles resulted in the mortality of a number of marine perch.⁶² Pile-driving with an impact hammer at the Port of Seattle of similar or larger piles resulted in the mortality of Pacific Herring. Similar construction for the Mulkiteo ferry dock in Washington State used a bubble curtain and did not result in any documented fish kills.⁶³

The fish kills associated with pile-driving for the Benicia-Martinez Bridge took those involved in the project by surprise, as the region has a long history of pile driving for piers, docks and smaller bridge structures which were not accompanied by observations of fish kills of this nature. The observed fish kills resulted in work on the Benicia-Martinez Bridge being shut down until a way to eliminate or minimize the project's impact on fish. In response, Caltrans District 4 designed a bubble curtain that has significantly reduced the fish kills associated with pile-driving for the projects where they are employed. The bubble curtain design consists of pressurized air being piped through a series of hoops located around the steel piles while they are being pounded into the Bay floor. The underwater sonic waves, which can be fatal to fish, are disrupted and attenuated by the bubbles.⁶⁴ Caltrans reports that the bubble curtain, known as the Air Bubble Curtain, reduced sound levels by 30 decibels and pressure waves by 99 percent. This design not only mitigated the effects on fish, it also reduced the time and cost that would have been associated with using existing bubble curtain designs or other attenuation devices. For its design of this bubble curtain system, Caltrans District 4 has been recognized by the Federal Highway Administration as one of the 11 innovations of excellence for 2005.

Pile-driving is one of the noisiest operations associated with construction activities in the Bay. Pile-driving in aquatic environments creates hydroacoustic pressure that can result in effects on fish ranging from altered behavior and avoidance to hearing loss, tissue injuries or immediate mortality.⁶⁵ Although past projects and observations indicate that major fish kills can result from driving large diameter, steel piles with an impact hammer and that pile-driving activity can cause disturbances in the behavior of marine mammals, causing them to flush from or avoid an area, there is still much that is unknown about the effects of pile-driving. Most of the current information is based on observations of a single event or on inferring from other types of human-made noises such as underwater blasting.⁶⁶ It is believed that the effects depend upon the conditions at the site (e.g., salinity, temperature, depth, geology, channel morphology, use of area as habitat for foraging or spawning or nursing), and the aquatic organisms present during construction activities. The species, size and physical condition of the aquatic organisms present are all thought to be factors, as is the duration of exposure.⁶⁷ Other relevant factors include the type and size of the pile, the type and hardness of the substrate and how deep the pile can be driven before there is resistance.⁶⁸

A lack of conclusive data on the effects of pile-driving on aquatic organisms has led regulatory agencies to be conservative in the approach to pile-driving projects.⁶⁹ The need for further studies is recognized and work done in the Bay Area at the Port of Oakland and by Caltrans on the San Francisco-Oakland Bay Bridge East Span project has provided the

⁶² HDR Alaska Inc. April 2003. Gravina Access Project. Marine Environment Impact Assessment.

⁶³ HDR Alaska Inc. April 2003. Gravina Access Project. Marine Environment Impact Assessment

⁶⁴ Holstege, Sean. April 23, 2005. Bay Bridge Receives Environmental Award. Oakland Tribune.

⁶⁵ Hedges, Christopher. 2005. Predicting and Mitigating Hydroacoustic Impacts on Fish from Pile Installation. National Cooperative Highway Research Project. Pending Project.

⁶⁶ Hastings Ph.D., Mardi C. and Arthur N. Popper Ph.D.. August 23, 2005. Effects of Sound on Fish.

⁶⁷ Hedges, Christopher. 2005. Predicting and Mitigating Hydroacoustic Impacts on Fish from Pile Installation. National Cooperative Highway Research Project. Pending Project.

⁶⁸ Daily Journal of Commerce, Portland, Oregon. June 3, 2004. Fish Kills Drive Techniques for Placing Bridge Piles

⁶⁹ Strategic Environmental Consulting, Inc. April 8, 2005. Final Report—Monitoring the Effects on Three Species of Fish.

opportunity to study the impacts. An effort to compile all of the existing information on the effects of sound on fish and to identify the types of studies that are needed to address areas of uncertainty resulted in a report entitled *Effects of Sound on Fish*. The report identifies the lack of conclusive data from which to develop “clear cut rules” and states that the data currently available is not peer-reviewed and is inadequate for the purposes of developing scientifically supportable criteria that will protect fish from the effects of pile-driving.⁷⁰

A study conducted at the Port of Oakland was designed to look specifically at the impacts of driving two-foot diameter, concrete piles with a diesel hammer on three, local species of fish—shiner perch, Chinook salmon and northern anchovy. The report issued on the study, *Monitoring the Effects of Conventional Pile Driving on Three Species of Fish*, provided detailed information on the experiment and the conclusions. The findings, that there was no significant difference between the fish subjected to pile-driving and the control group, “indicate that pile-driving with a diesel hammer on concrete piles does not result in injuries to adult northern anchovy, adult shiner perch or juvenile Chinook salmon at a depth of 25 feet a distance of approximately 32 feet from pile-driving where peak pressure levels as high as 192 decibels for three to four minutes.”⁷¹

Although there is a lack of peer-reviewed data, observations and studies conducted on existing projects provide indications of what types of pile-driving projects are likely to have significant effects on fish. The majority of pile-driving projects that have resulted in observable fish kills have been unattenuated and consisted of the driving of large diameter, steel piles by impact hammer. As further studies are conducted, it is hoped that the information and data derived will result in the appropriate design and construction techniques or mitigation strategies for each type of pile-driving project based on a better understanding of the risks associated with each type of project. A number of strategies are available and have been employed, including bubble curtains, time constraints, strobe lights, foam bladders wrapped around the piles, alternate hammers, cushions between the hammer and the pile and large-coverage bubble mats on the sea floor. To date, the bubble curtain has been the most effective when considering both performance and cost.⁷²

Eelgrass Beds. The construction of a bridge over the Commission’s jurisdiction could also have impacts on habitats found on the open bay and result in a reduction of habitats such as eelgrass beds that provide feeding, sheltering and spawning areas for many fish and invertebrates, as well as providing a foraging area for some bird species. The Bay Bridge project is disturbing some eelgrass beds and is responsible for the restoration of this habitat. There have been some eelgrass restoration projects in Washington as a result of ferry projects and these projects are providing lessons for future restoration projects.

Navigational Impacts. The navigation of a variety of watercraft, from cargo ships to kayaks, can be disrupted by the construction of bridge over the Bay’s waters. Unless constructed to accommodate navigation, bridges could seriously impeded the navigation of certain parts of the Bay by being too low or having piles set too close together to allow for passage. While this may be apparent for bridges that span the Bay, it may not be taken into account when designing structures over other parts of the Bay, such as certain waterways.

Air Quality and Water Quality Impacts. The predominant use single-occupant vehicles for transportation has been linked to a number of impacts associated with the degradation of air and water quality. Vehicles contribute to pollutants that cause smog, acid rain, global warming and ozone depletion. Travel emissions account for 61 percent of carbon monoxide, with motor

⁷⁰ Hastings Ph.D., Mardi C. and Arthur N. Popper Ph.D.. August 23, 2005. *Effects of Sound on Fish*.

⁷¹ Strategic Environmental Consulting, Inc. April 8, 2005. *Final Report—Monitoring the Effects on Three Species of Fish*.

⁷² Daily Journal of Commerce, Portland, Oregon. June 3, 2004. *Fish Kills Drive Techniques for Placing Bridge Piles*

vehicles making up 94 percent of travel.⁷³ Motor vehicles also contribute to 30 percent of Nitrous Oxide and volatile organic compounds. Vehicles such as buses, ferries and trains that operate on diesel have also been identified as contributing to air quality problems. According to the American Lung Association of California, diesel particulates are the most significant source of air toxics in the State, accounting for 70 percent of the cancer risk from toxic air contaminants statewide. Studies have also shown that diesel exacerbates lung diseases such as asthma and emphysema. The Environmental Protection Agency estimated in a 1996 National Toxics Inventory that vehicles including cars, trucks and buses, release approximately three billion pounds of cancer-causing, hazardous pollutants to the air each year. The San Jose-San Francisco-Oakland metropolitan area is identified as 15th out of 25 cities in the United States most polluted by short term particle pollution.⁷⁴

The example of the Atlanta Olympics is often used to illustrate the impacts that vehicles can have on public health. When the City of Atlanta hosted the Olympics the city discouraged driving and encouraged public transit. Street closures and other difficulties made it harder for people to drive, while public transit service was increased and improved to serve a greater number of people more conveniently. This resulted in reducing the number of people driving by 22.5 percent and in an increase in public transit usage. The resulting impacts to air quality were that peak ozone decreased by more than 25 percent over the previous four-week period and significantly lower rates of childhood asthma events for ages 1 through 16. Childhood asthma events decreased by 42 percent during the four week period, while there was no other corresponding decrease in other types of health problems.⁷⁵

Although the regional level air quality impacts associated vehicle usage have been widely documented, the localized impacts that are associated with proximity to freeways, railroad tracks, heavy trucking and commercial water vessel traffic are just beginning to be understood. Many studies have consistently demonstrated a positive association between childhood asthma and residential exposure to heavy traffic. One study looked at the relationship between pediatric hospitalization for asthma and living near a heavily traveled roadway. The study included 934 children, ages 0 to 14 years, of the same ethnicity and measured the distance from traffic routes to each child's home. This study found that children living in areas with heavy traffic density or heavy trucks and trailers passing within 200 meters of their homes had an increased risk of asthma hospitalizations after controlling for age and poverty level.⁷⁶ A similar study is being conducted in Southern California looking at 5,500 children in 12 communities over 10 years. The communities were selected so that six of the communities would have a lower than average ozone, while six would have a higher than average ozone. To date, clear correlation has been found between lower lung function in children and more intense air pollution. Children growing up in smoggier air tend to be slower in their lung function growth when compared to children with lower exposures to air pollutants associated with high traffic areas.⁷⁷

The relationship between water quality and surface transportation has not been as thoroughly analyzed as the relationship between surface transportation and air quality. However, more research is being conducted and it is adding to the understanding of the water quality impacts related to surface transportation. The Pew Oceans Commission found in its studies that the percentage of roadways, parking lots and other impervious surfaces in a watershed is significant in determining the health of the watershed. In watersheds where more than 10 percent of the overall acreage is covered with impervious surfaces, it is likely that the waterways in that watershed are seriously degraded. The untreated runoff from roadways and

⁷³ Petersmark PhD, Karen and Risa Wilkerson. May 2003. Land Use Affects Public Health.

⁷⁴ American Lung Association. 2004. State of the Air Report.

⁷⁵ American Lung Association. 2004. State of the Air Report.

⁷⁶ Lin, Shao, Et.Al., Increased Childhood Asthma Hospital Visits Linked to Proximity to Traffic.

⁷⁷ Peters, John. 2001. Children's Health Study. Part of Long-Term Exposure. Health Effects Research Program. California.

parking lots produce increased pollutant loadings to these waterways. The pollutants associated with this runoff include particulates and heavy metals from exhaust fumes, copper from brake pads, tire and asphalt wear deposits and oil, grease, antifreeze, hydraulic fluids and cleaning agents. Parking lots and roadways also reduce groundwater recharge and can increase the water volume and speed to waterways. As parking lots, roadways and bridges replace wetlands and naturally vegetated landscapes, less rainfall and pollutants are percolated and filtered and more surface runoff and pollutants reach the Bay. As an example, the volume of water that washes off of a one-acre parking lot during rainfall is about 16 times greater than that which runs off of a one acre meadow.⁷⁸ According to the Environmental Protection Agency, Office of Water, the contaminants in runoff pollution from roads, highways and bridges include sediment, oils and grease, heavy metals, rubber, antifreeze and debris.

Local Impacts and Environmental Justice. Bridge and roadway projects have often resulted in more significant negative impact to the communities that surrounded such projects. While this may seem obvious, that the neighborhoods that surround a project will receive more impacts from that project, it is important to recognize the number and degree of the impacts associated with bridge and roadway projects. The communities where bridge and roadway projects are located not only suffer the fragmentation that was previously described; they also suffer from air and water quality degradation and an increase in noise levels that do not similarly impact neighborhoods that are further away. Large infrastructure projects have often been located in disenfranchised communities that do not have the political power to oppose such projects. The result of this past practice is that these communities bear the burdens associated with the major transportation infrastructure projects in a region, while the rest of the region benefits from the expansions. The communities where these projects are located often suffer dislocation and fragmentation during and after the construction of the project and these projects continue to contribute to unsafe and unhealthy conditions for these neighborhoods.

The Cypress Freeway and its reconstruction in Oakland provide a good example of the types of impacts that a freeway project can have on a neighborhood. The Cypress Freeway was completed in 1957 cutting through the community of West Oakland, separating approximately four-square-miles from the rest of the City of Oakland. As one former Oakland resident described it, "Cypress opened the door. It really split the city physically. It was the beginning of the end. It ruined the integrity of the whole area."

When the Loma Prieta earthquake damaged the Cypress Freeway in 1989, Caltrans proposed to rebuild the freeway in its existing location. The community, tired of the fragmentation, noise, fumes and other impacts associated with the freeway resisted Caltrans plans and pushed the agency to re-align the freeway and reduce the impacts. The community was increasingly concerned about the industrial, port and transportation uses in their midst and the possibility that these facilities were having an impact on not just their quality of life but also their health. According to studies conducted by Children's Hospital of Oakland and the California Department of Health Services, the community did suffer from a higher than expected rate of hospitalization for asthma and certain forms of cancer.⁷⁹ In 1989, more than 35 percent of West Oakland residents lived below the poverty level. At the time that the 1990 census was conducted the vast majority of the West Oakland residents are African American, with whites making up 11 percent and Hispanics, Asians and Native Americans making up the rest. West Oakland residents felt that Caltrans' proposal did not take their concerns into account because of the economic and ethnic make up of the community. As one West Oakland resident put it, "[h]ow about putting the freeway through Blackhawk or Danville? Why is the poor community always having to pay?"

⁷⁸ Jackson MD, Richard and Chris Kochtitzky. Creating a Healthy Environment: The Impact of the Built Environment on Public Health.

⁷⁹ California Department of Health Services. 1993. Alameda County Census Tracts 4018, 4019, 4020, 4021, 4022, 4025 Combined. The Incidence of Invasive Cancer, Selected Anatomic Sites. 1987-1993.

The final reconstruction of the Cypress Freeway took into consideration the concerns of the community and resulted in a realignment of the structure to the west in order to reconnect the majority of West Oakland to the larger city. Mitigation measures, such as sound barriers, landscaping, air conditioning systems and soundproofing for certain structures near the new alignment. The realignment also attempted to move much of the truck traffic associated with the Port of Oakland out of the community and off of its local streets. Today, the location where the old Cypress Freeway once stood is being transformed into a landscaped boulevard with community spaces, street lamps, benches, cycling and walking trails.⁸⁰

The concept of environmental justice was established in order to address these existing inequities and avoid future ones. Environmental justice is term that describes the desire to ensure that the impacts of decisions, such as where to invest transportation money, where to site a power plant or where to locate a public open space area, do not result in disproportionate impacts on one community or group of people. California state law defines environmental justice as “the fair treatment of people of all races, cultures and income with respect to the development, adoption, implementation and enforcement of environmental laws, regulations and policies.” Since transportation policy can have such significant impacts on communities, environmental justice concerns often arise in transportation decisions. The *Environmental Justice and Transportation, A Citizen’s Handbook*, describes environmental justice in the following way: “It is fundamentally about fairness toward the disadvantaged and often addresses the exclusion of racial and ethnic minorities from decision making.” The Handbook goes on to describe the types of situations where environmental justice issues most frequently arise in transportation policy decision-making:

- Some communities get the benefits of improved accessibility, faster trips, and congestion relief, while others experience fewer benefits;
- Some communities suffer disproportionately from transportation programs’ negative impacts, like air pollution;
- Some communities have to pay higher transportation taxes or higher fares than others in relation to the services that they receive; or
- Some communities are less represented than others when policy-making bodies debate and decide what should be done with transportation resources.⁸¹

Environmental justice concerns may arise with the siting and design of bridge and roadway projects within BCDC’s jurisdiction. The Commission has adopted a procedure to address environmental justice in its planning and regulatory process by directing staff to identify and analyze environmental justice where and when applicable in its proposed project permit application summaries and in its planning reports. Although the Commission’s authority is limited with respect to most environmental justice concerns, one way the Commission could address environmental justice issues is to require that the public access required with the project and the mitigation required for the project be located, to the maximum extent practicable, within the community where the impacts will occur.

Alternative Fuels. Some of the effects of vehicle usage on air and water quality can be reduced by using fuels alternative to gasoline and conventional diesel. Purchasing automobiles, buses, ferries and trucks that run on alternative fuels can increase energy efficiency and reduce the effects that conventional gasoline and diesel vehicles have on air and water quality, at both a regional and a neighborhood scale. The Energy Policy Act of 1992 defined alternative fuels to include biodiesel, hydrogen, propane, electric, methanol, ethanol and natural gas. Alternative

⁸⁰ United States Department of Transportation, Federal Highway Agency and the Federal Transit Agency. 2001. Environmental Justice Case Studies.

⁸¹ Cairns, Shannon. 2003. Environmental Justice and Transportation A Citizen’s Handbook. Institute of Transportation Studies at the University of California,, Berkeley.

fuel vehicles were defined to include any flexible fuel or dual fuel vehicle designed to operate on at least one alternative fuel. The use of alternative fuels can reduce the release of certain emissions. For example, replacing conventional diesel with biodiesel reduces the particulate matter and gas emissions that are thought to be associated with global warming and neighborhood asthma-related events. The use of hybrid gasoline and electric technology increases fuel efficiency and reduces emissions over conventional gasoline vehicles. Cleaner diesel technology is also being developed to reduce the emissions associated with diesel engines.

The Environmental Protection Agency is attempting to reduce the effects of diesel trucks and buses through its 2007 Heavy-Duty Highway Final Rule. This rule is designed to ensure that heavy-duty trucks and buses run cleaner by replacing old fleets with vehicles that will reduce harmful pollution by 95 percent through pollution-control technology and reformulated fuel. It is estimated that these vehicles running on reformulated fuel will reduce approximately 2.6 million tons of nitrogen oxide emissions and reduce soot and particulate matter by 110,000 tons a year. According to the EPA, the removal of this pollution should result in the prevention of approximately 5,500 cases of chronic bronchitis, 8,300 premature deaths, 17,600 cases of acute bronchitis in children and will help avoid more than 360,000 asthma related incidents a year.

The Bay Area Air Quality Management District has several grant programs that fund projects designed to expand low-emission vehicle usage. These grants are designed to encourage the use of clean fuels by funding projects that result in the purchase of low-or zero-emission vehicles or engines, add pollution control technology to existing vehicles and increase the access to infrastructure in the region that can supply alternative fuels.

The use of alternative fuels could result in a number of positive changes for the region and for neighborhoods in the Bay Area that are adjacent to ports, freeways or transit terminals. By reducing the amount of pollution associated with vehicle use at these sites, the region could more easily meet its federal air quality objectives and it could result in significant improvements to the air quality at sensitive receptors such as schools, hospitals, residential neighborhoods and parks.

CHAPTER 5

RAIL

The Bay Area once had a thriving rail system, including a number of intercity rail services that operated in Marin County, the East Bay and the Peninsula. The Key System was an inter-urban light rail system that operated from the 1900s to the 1950s, connecting the cities of Richmond, Albany, Berkeley, Oakland, San Leandro and San Francisco. Prior to the construction of the Bay Bridge, the Key System extended out into the Bay from Emeryville and connected to a ferry that took people to San Francisco. The Bay Bridge was constructed in 1936 with accommodations for the Key System, which could then take travelers directly to Transbay Terminal in San Francisco without the ferry stop.⁸² The system was purchased by a subsidiary of General Motors and dismantled in 1958 over the objection of many municipalities in the region.⁸³ The interurban rail service that operated on the Peninsula carried approximately 16,000 passenger round trips per day. This compares to the Caltrain service that carries approximately 28,000 passenger trips per weekday. Rail service was eliminated or significantly reduced through a series of policy decisions made in the 1950s and 1960s.

As a legacy of the Bay Area's thriving rail system, more than 600 miles of track still exist in the region and the use of these tracks to move people and goods around the region has begun to increase over the last decade. Existing rail service in the Bay Area includes Caltrain, the Altamont Commuter Express, the Amtrak Capitol Corridor and a light rail system run by the Santa Clara Valley Transportation Authority that serves San Jose and its suburbs. Figure 5 identifies the existing and proposed rail systems in the Bay Area.

Amtrak Capitol Corridor. The Amtrak Capitol Corridor system is planned and implemented by the Capitol Corridor Joint Powers Authority and consists of 170 miles of track that link San Jose to Auburn, stops at 16 stations and runs 24 weekday and 18 weekend trains between Oakland and Sacramento, 14 daily trains between Oakland and San Jose, as well as daily service to Roseville and Auburn. Ridership is growing on the Capitol Corridor, as is congestion on the tracks that the trains use. The number of trains that the system runs has increased within the last decade. The system serves both commute trips and weekend and special events and is considering adding stations in the Bay Area. Ideas for stations in Benicia, in Hercules and in Union City have been discussed, but none of these sites have been formally adopted as future station sites. The site that the City of Benicia has chosen is in BCDC's jurisdiction and is located in an undeveloped area of the Bay shoreline.⁸⁴ The site in Union City is at the existing BART station and would provide the opportunity for the two rail systems to link fairly seamlessly. The Union City site is also surrounded by underused land that is being planned by Union City for transit-oriented development. The Capitol Corridor Joint Powers Authority is working closely with the Peninsula Corridor Joint Powers Board on this project, including the proposal to rehabilitate the Dumbarton Rail Bridge to return train service to this bridge. The Capitol Corridor Joint Powers Authority also works closely with local bus providers to ensure that feeder bus service is available and convenient to riders that live in outlying communities.⁸⁵

Of the proposals for new stations associated with the Capitol Corridor system the one that has the potential to have impacts on the Bay is the proposal for a station in Benicia. A portion of the site that was selected by the City of Benicia and approved by the City Council would likely be located within BCDC's jurisdiction. Preliminary plans indicate that a new station would require the development of a new station building, approximately 3,000 parking spaces and

⁸² Trainweb website.

⁸³ Oakland Tribune. April 2, 1948. Oakland, Berkeley Blast Key System Bus Move.

⁸⁴ City of Benicia. April 18, 2000. City Council Meeting.

⁸⁵ Capitol Corridor Joint Powers Authority. 2005. Business Plan Update, FY 2005/06-FY 2006/07 Update.

access roads. The site is in an area of the shoreline that has no development and is separate from the existing development pattern of the city. Some are concerned that the location of a new train station and transit center at this site would have impacts to the natural resources at the site and induce development in the surrounding area known as Sky Valley. The City Council attempted to reduce these concerns by going on record as firmly opposing any new development in the area and stating that any additional development in the area would require approval by voters in Benicia.⁸⁶

Another possible project within the Commission's jurisdiction is the widening of the Union Pacific railroad tracks that are currently used by the Capitol Corridor passenger trains and for cargo movement by the Port of Oakland. Both passenger rail and cargo rail have increased in frequency over the last five years and congestion on the tracks is becoming an issue for both the Port and the Capitol Corridor. In addition to the congestion on the tracks, the increase in the number of trains has also resulted in more significant impacts to the surrounding communities. The existing tracks have a number of at grade crossings, where automobile, bicycle and pedestrian travel is impeded when the trains are moving through. These at grade railroad tracks and crossings limit public access to the Bay and create an unsafe environment for pedestrians and cyclists traveling near the Bay or along its shoreline. Expanding or improving existing tracks or developing new tracks could reduce these impacts if the changes included grade separated tracks or the provision of a sufficient number of grade separated crossings.

Caltrain and Dumbarton Rail Bridge. Caltrain, operated by the Peninsula Corridor Joint Powers Board, currently serves the Peninsula and South Bay, from San Francisco to Gilroy, over 77 miles of track. Service has recently expanded from 52 to 86 trains that serve 34 stations. Caltrain began Baby Bullet service in June 2004, which includes five morning and five evening trains on weekdays. Baby Bullet service allows people to travel between San Jose and San Francisco in under one hour. In order to address parking constraints, increase ridership and reduce the number of people who must drive to the stations, Caltrain has 32 workplace shuttles, encourages cycling to the station through accommodating bicycles at the stations and on board the trains, charges a parking fee and is working on encouraging transit-oriented development near existing stations.⁸⁷ Caltrain connects with BART at BART's new Milbrae Station and is planned to connect to BART in downtown San Francisco with an extension to the Transbay Terminal.

A short range plan has been drafted that identifies plans for Caltrain from 2004 to 2013. This plan includes service expansion—a connection to Union City across a rehabilitated Dumbarton Rail Bridge which is located south of the Dumbarton Bridge. This would connect Caltrain to both BART and the Capitol Corridor service in the East Bay. The proposed service would include six trains in the morning and six trains in the evening, half of them between Union City and San Jose and half of them between Union City and Millbrae. The initial ridership projections for the service are from 2,500 to 2,800 riders per day.⁸⁸ Additionally, the draft plan discusses plans to reduce the number of stations along the existing corridor as a way to speed service and eliminate stations with low ridership that are in close proximity to other stations. The draft plan includes a vision of future service that includes 138 daily trains, express service every half hour, 78 shuttle buses to worksites, extensions to downtown San Francisco and to Union City and total grade separation with four tracks. The plan also includes high speed rail

⁸⁶ City of Benicia. November 13, 2000. Benicia Railroad Station. Letter to the Citizens of Benicia from Vice Mayor Pierre T. Bidou.

⁸⁷ Peninsula Corridor Joint Powers Board. Riders Guide.

⁸⁸ San Mateo County Transportation Authority. 1999. Dumbarton Rail Corridor Study.

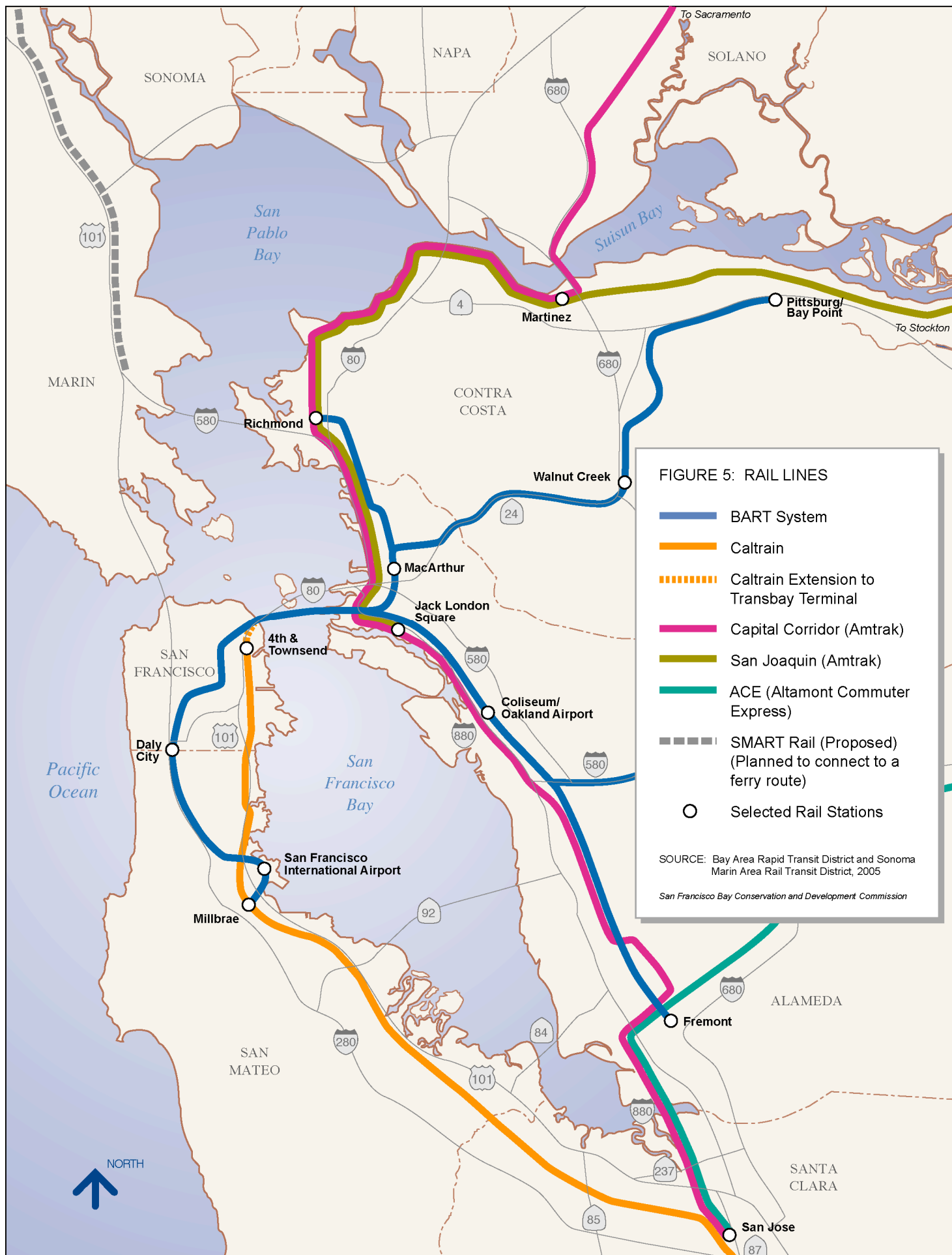


Figure 5 back

service using the Caltrain tracks for the portion of the High Speed Rail system that connects between San Jose and San Francisco.⁸⁹ The plan for the Dumbarton Rail Bridge rehabilitation and a return of rail service to this bridge is the only likely Caltrain project located within BCDC's jurisdiction. However, although most of Caltrain's activity occurs outside of the Commission's jurisdiction, the Caltrain service's success and effectiveness in serving people who travel along the peninsula corridor reduces the number of people who must drive within this corridor and reduces pressure on the Bay and its shoreline for additional transportation infrastructure.

Altamont Commuter Express. The Altamont Commuter Express (ACE) system runs trains between Stockton and San Jose. The ACE system has 10 stations, runs three morning and three evening trains and serves approximately 3,000 riders per day. The ACE system is implemented and planned by the San Joaquin Regional Rail Commission and the Altamont Commuter Express Joint Powers Authority. Service began in 1998 with two trains and a third was added in 2001. The ACE system serves a transportation corridor that has seen increasing development and congestion and ACE is one of the few alternatives to the single-occupant vehicle in the corridor. Portions of this corridor are also extensively used by trucks moving cargo from the ports in the region. The increasing congestion on Interstate 580 that links the rapidly urbanizing areas to the east with jobs in the west is resulting in increased costs and delays for cargo movement. Alternatives to the single-occupant vehicle in this corridor can provide a relief to that congestion and possibly speed cargo movement from the ports to Interstate 5.

Sonoma-Marin Rail Transit Proposal. In the North Bay there is a proposal to link Sonoma and Marin counties with rail service using an existing rail right-of-way adjacent to the US 101 corridor. The proposal, known as the Sonoma-Marin Rail Transit (SMART) project, would include approximately 70 miles of track that would link Cloverdale in Sonoma County to San Rafael in Marin County in the first phase and would extend to either an existing or proposed ferry terminal in the second phase in order to provide access to San Francisco. The service would have approximately 14 stations, which would require parking lots and shuttles to accommodate the low-density development pattern in Sonoma County. The first phase would serve those in Sonoma County who travel to Marin County, which accounts for approximately 50 percent of the traffic on US Highway 101. The second phase would connect to a San Francisco bound ferry route at the existing Larkspur Ferry Terminal or at a new terminal at either San Quentin or Port Sonoma.⁹⁰ Initial ridership projections indicate that approximately 5,000 people per day would use the system.⁹¹

On January 1, 2003 the Sonoma-Marin Rail Transit District was established by Assembly Bill 2224 (Nation) to oversee the development of SMART service. In addition to identifying the potential sites for the 14 stations, nine in Sonoma County and five in Marin County, the SMART District is also developing a Transit and Pedestrian Oriented Program and Policy Framework for SMART station planning. In this Program and Policy Framework, SMART identifies a set of goals, policies and programs that include charging for parking at all SMART stations, selecting station sites based on the site's potential for transit-oriented development, improving pedestrian and bicycle access around and to new station areas and developing a clear strategy for transitioning surface parking to development of parking structures and mixed use development around the stations. The Program and Policy Framework identifies the parking fees as a way to fund the future construction of structured parking and to fund pedestrian, bicycle and transit access improvements.

Portions of the SMART proposal may be located in BCDC's jurisdiction, including a ferry terminal to provide service to San Francisco. The potential sites include the existing Larkspur ferry terminal, a possible terminal at San Quentin or a possible terminal at Port Sonoma. If San

⁸⁹ Peninsula Corridor Joint Powers Board. October 7, 2004. 2004-2013 Short Range Transit Plan.

⁹⁰ Sonoma Marin Area Rail Transit Commission. 2000. Sonoma Marin Rail Implementation Plan.

⁹¹ Santa Rosa Press Democrat. "Will Rail Lure Riders?" on February 23, 2003 by Spencer Soper.

Quentin were no longer needed for the prison, then that site could accommodate a transit center that included a SMART station and a ferry terminal, mixed-use, transit-oriented development and feeder buses to the existing bus station in San Rafael. The Port Sonoma site however, does not appear to provide such an opportunity. This site is surrounded by sensitive ecological resources, restoration sites and open space. There would be little or no opportunity for transit-oriented development around Port Sonoma. Moreover, a ferry terminal at this site would likely eliminate or degrade habitats at the site and result in impacts to the rare, threatened and endangered species found at the site. Like the proposal for a train station in Benicia, the Port Sonoma site is located in an undeveloped, sensitive area that is not connected to the pattern of development in the area.

California High Speed Rail. The California High Speed Rail Authority was established in 1996 to plan, design, construct and operate a high speed rail system for the State of California. The proposed system would have 700 miles of track, serving the major metropolitan centers in the state. The Authority has estimated that this system could ultimately serve approximately 32 million intercity passengers and another 10 million commuters and attain speeds of more than 200 miles per hour. One proposed route begins in San Diego and follows both Interstate 5 and Interstate 15, provide for stops at the Los Angeles and Ontario International Airports, stop in Bakersfield and Fresno and run three lines that end in Sacramento, San Francisco and Oakland. Other routes are also considered. Express service between Los Angeles and San Francisco is estimated to take approximately two and a half hours. The Authority has completed a Final Program EIR/EIS that has identified the general alignment for the system. Currently, the proposal includes using the rehabilitated Dumbarton Rail Bridge across the Bay to access the East Bay.⁹²

High speed rail could reduce delays for air passengers and cargo, alleviate the congestion surrounding airports and be used to transport high value/time sensitive goods. It could also diversify the state's transportation system, increasing reliability and stability. High speed rail systems in other countries have historically been reliable and delays are rare. These systems are rarely impeded by weather delays, including fog and rain and, if the tracks are grade separated, not impeded by freeway congestion. Project proponents cite that high speed rail has been very reliable in Asia and Europe, having a good safety record and a near perfect on-time performance.⁹³

Concerns regarding high speed rail include the projected costs, the possibility that it would promote sprawl in the Central Valley and that it would eliminate or degrade ecological areas, parks and open spaces impacts. In the Bay Area, the plan for a high speed rail system to use existing tracks that are currently used by Caltrain, the Capitol Corridor and the Port of Oakland could also result in increased congestion on these tracks. Without an expansion of the existing tracks and high speed rail providing service that replaces existing service, the congestion on these tracks could seriously impede passenger and cargo rail movement in the Bay Area.

Cargo Rail. Rail is also contemplated as a possible way to improve cargo movement at the Port of Oakland. The Port has already increased the amount of cargo moved by rail with its Joint Intermodal Terminal project. As surface roadway congestion increases in the Bay Area, cargo movement by trucks takes more time and becomes more costly and less efficient. The use of short haul rail has been identified as an alternative to using trucks to move cargo. A more detailed description of cargo movement in the Bay Area is located in the goods movement section of this report.

San Francisco Bay Area Rapid Transit System. The BART system, which was approved by voters in 1962, began construction in the mid 1960s. The BART tunnel under the Bay was one of

⁹² California High Speed Rail Authority. May 2001. Draft Environmental Impact Report/Environmental Impact Statement.

⁹³ California High Speed Rail Authority. 2000. Final High Speed Train Plan.

the first permits that BCDC reviewed. It was approved by the Commission as Permit 8-65 and the Commission based its approval on finding that the project was necessary for “the health, safety and welfare of the public in the entire bay area.” When the system began carrying passengers in 1972, it consisted of approximately 71 miles and 34 stations serving 17 communities within 3 counties. Since that time, BART has expanded down the northern Peninsula first to from Daly City to Colma, and just recently to Millbrae, allowing passengers to make connections to the San Francisco International Airport and Caltrain. BART has also expanded east, extending to Pittsburg and Pleasanton. The system now includes 104 miles and 43 stations serving four counties.⁹⁴

In addition to expanding the system, the areas around several BART stations have been designed or redeveloped as transit-oriented developments. The areas around the Fruitvale and Pleasant Hill BART stations have both increased densities and diversified land use mix in order to increase the number of people and mix of goods and services that are located near BART stations.

BART has a significant impact in the Bay Bridge corridor, carrying 27 percent of the weekday trips through the corridor or 160,700 people. A large majority of the transit trips made in the Bay Bridge corridor are made on BART. After BART, AC Transit’s transbay buses are the second most utilized transit service in the corridor, carrying three percent of the weekday trips in the corridor or 15,200 people.⁹⁵ Four of the five BART lines serve this corridor and during the peak periods, 27 trains per hour serve the corridor. During the morning peak hour between 7:30 a.m. and 8:30 a.m., BART carries 13,900 westbound passengers.⁹⁶ For perspective, the carrying capacity for the Bay Bridge’s five lanes is 10,000 vehicles. If all of the people who rode BART were to drive alone, the Bay Bridge would be at a stand still.

In a 1998 BART station profile study it was found that 49 percent of riders drive to BART, 26 percent walk, 23 percent arrive by other transit and three percent bicycle to BART. BART has attempted to address the parking impacts of the system by coordinating services with AC Transit and other bus services, charging for parking spaces at certain stations and looking at the transit-oriented development potential of some of its existing and proposed stations. At the Fruitvale Station, the development of a new parking lot turned into the development of a parking structure and a mixed use development. The project includes high density residential development, commercial and community serving uses. Although a result of community pressure, the project provided BART and the region with a model of how to turn an area that was once devoted to surface parking and underused land into a vital part of the community that should increase the number of people that are able to walk to BART and increase the number of people that use the service. As the existing BART stations mature, these opportunities to shift surface parking areas into mixed density, transit-oriented development should increase and provide examples for the types of development that is most suitable for areas around the public transit stations that may be developed in the region. For the Bay, the more people that are able to take BART the less pressure there is on the Bay to place transportation infrastructure along its shoreline and as fill in the Bay. A good example of this is the Bay Bridge corridor. Without BART, or a similar kind of project to serve that corridor the pressure to locate an additional bridge (or two) in that that corridor would be substantial. In fact, it is likely that a second bridge would already have been located in the Bay and there would be support for placing a third in the corridor.

Light Rail. Light rail is an important component in the region’s transportation network, linking neighborhoods to regional transit systems. The San Francisco Municipal Railway has a five-line underground metro system, a surface streetcar line and three cable car lines. These nine lines have a weekday ridership of over 180,000 passengers. Several of these lines, the F-

⁹⁴ Bay Area Rapid Transit Website.

⁹⁵ Metropolitan Transportation Commission. 2002. Bay Crossings Study

⁹⁶ Bay Area Rapid Transit Website.

Market to Fisherman's Wharf and the N-Judah to Mission Bay, have particular value for bringing large numbers of people down to the shoreline. A sixth metro line is proposed to link the 3rd Street corridor in San Francisco's Bayview neighborhood to Chinatown. This line will expand access to and from these neighborhoods and link them to regional systems such as Caltrain and BART, considerably improving mobility for the residents of these neighborhoods. The new line should also provide economic opportunities around the new transit line as once isolated areas of the city are knitted together and become more connected to the rest of the city.

The Santa Clara Valley Transportation Authority (VTA) continues to expand and currently links downtown San Jose to Milpitas, Mountain View and Campbell. The light rail system consists of four lines and provides connections to Caltrain, ACE and the Capitol Corridors systems.

Rail Projects in BCDC's Jurisdiction. The rail projects that may be proposed within the Commission's jurisdiction in the next few decades include new rail stations, the Dumbarton Rail Bridge rehabilitation, the expansion of the Union Pacific railroad tracks in the East Bay and a possible ferry terminal and new rail lines as a part of the SMART project. The high speed rail project does include a crossing of the Bay, but the current proposal would use the Dumbarton Rail Bridge crossing, which is already planned for rehabilitation and rail service. The resurgence of rail service in the Bay Area may result in an additional transportation alternative that could move people and cargo through the region more efficiently than the single-occupant vehicle, thereby reducing the pressure to fill the Bay. However, the addition of new rail lines could also result in pressure to fill the Bay, its tidal marshes and tidal flats. Rail projects, like bridges and ferries, should be sited and designed to avoid sites with tidal marshes, tidal flats and other valuable wildlife habitat. Many of the rail services and proposals described above are using existing tracks or trackways, have plans to incorporate transit-oriented development and to accommodate pedestrians and cyclists with safe and convenient access to and around station areas. However, rail has historically had significant noise, safety and movement impacts on nearby communities and has resulted in separating people from the Bay shoreline in many communities. New rail projects near the Bay shoreline could reduce these some of these impacts by developing grade separated crossings or grade separated tracks, developing strategies to reduce parking at shoreline terminal sites and site and design stations to put pedestrians and bicycles first.

CHAPTER 6

FERRY SERVICE

Ferry service in the Bay Area has followed a similar path of that of rail service. Ferry service was once a thriving system in the Bay Area, one that carried a significant number of people every day and was critical to the region's mobility. Ferry service was eliminated at around the same time that much of the rail service was eliminated in the Bay Area. Through a series of policy and funding decisions, ferries were no longer operating on the Bay by 1959. Like rail service, ferry service is also making a comeback and began operating again on the Bay in the late 1960s. Over the last decade, a number of proposals have been developed for expanding use of ferryboats for commute trips, recreation trips and to move cargo. Some of these proposals, such as the WTA's plans to increase ferry service on the Bay, are in the process of being implemented and should result in new ferry routes operating in the Bay over the next ten years. Other proposals, such as the National Park Service's idea for ferry routes that would serve the Golden Gate National Recreation Area, ferry service between the two airports and the idea of moving cargo by ferryboat, are still in the early planning and concept stages.

Prior to the bridges being completed in the late 1930s, the Bay Area had a substantial network of ferryboats. This system, which was the only way to cross the Bay at the time, moved between 50 and 60 million people annually. It consisted of 50 boats, 30 major crossings, served approximately 30 locations and brought over 250,000 passengers through the San Francisco Ferry Building every day. Most of the bridges across the Bay were opened to automobiles in the late 1930s, including the Bay Bridge and the Golden Gate Bridge in the late 1930s. During the next 20 years, many factors contributed to the reduction and, finally, the elimination of ferry service on San Francisco Bay. These factors included the completion of the bridges, the popularity and accessibility of the automobile, the suburban nature of development-particularly after World War II and legislation that supported automobiles over other modes of transportation. An example of such legislation is a state law that was directed at encouraging drivers to use the new Bay Bridge. This law barred all other modes of transit from operating within 10 miles of the Bay Bridge. After suffering significant declines in ridership and funding, all ferry service was eliminated on the San Francisco Bay in 1958.⁹⁷

As congestion on the bridges began to overwhelm capacity, alternative modes of transit were sought. In response to the congestion in the Bay Bridge corridor, the legislature voted to authorize the BART system in the early 1960s. This authorization did not lift the ban on ferryboats, which were still prohibited from operating within the Bay Bridge corridor. The North Bay, which was not going to be served by the initial BART system, re-instituted ferry service in response to increasing congestion on the Golden Gate Bridge. The first ferry route to return to the Bay began service between Tiburon and San Francisco in the 1960s. In the 1970s, two new routes were added which provided service between Sausalito and San Francisco and Larkspur and San Francisco. It was not until the late 1980s, after the Loma Prieta earthquake, that ferry service resumed between the East Bay and San Francisco. The state legislature repealed the prohibition against ferry service in the Bay Bridge corridor in response to the success of the ferry service that was deployed to move people across the Bay after the failure of the Bay Bridge during the earthquake. This crisis illustrated the importance of ferry service as a way to move people in emergencies and for other events. It also converted some people, who found that they preferred the ferry ride across the Bay to congestion on the bridge, to permanent ferry riders. Ferry service has provided an important link across the Bay in several

⁹⁷ Metropolitan Transportation Commission. December 1998. San Francisco Bay Area Regional Ferry Plan Update.

other circumstances, such as the mudslides in Marin County in 1982, the BART strike in 1997, a BART power outage in 1998 and concerns of terrorist attacks on Bay Area bridges in 2001.⁹⁸

In addition to increased roadway congestion and singular events that highlighted the possibilities for ferry use in the Bay Area and the opportunity provided by the repeal of legislation affecting the Bay Bridge corridor, ferry service has also benefited from improvements to the vessels. The most significant improvement to ferry service has been the increased operating speeds that ferries are capable of achieving, which have resulted in reduced operating costs. As recently as the mid-1980s, the fastest conventional ferry could travel at only about 20 miles per hour. These slow speeds made ferry service non-competitive with automobiles, particularly over longer distances. Less than 20 years later, new ferry boats can easily travel at speeds of more than 40 miles per hour. This doubling of ferry boat speeds has made water travel more cost effective, made it possible to provide service over greater distances and reduced the time it takes to travel across the Bay. All of these factors have contributed to making ferry service competitive with other modes of transit, particularly for those with few alternatives to the automobile who travel heavily congested corridors and those that live and/or work in close proximity to a ferry terminal.

Existing Ferry System. Currently, seven existing routes on the Bay serve nine terminals. These routes are Oakland-Alameda-San Francisco, Harbor Bay-San Francisco, Vallejo-San Francisco, Sausalito-San Francisco, Larkspur-San Francisco and Tiburon-San Francisco. The shortest routes, at six miles, are the Sausalito to the San Francisco Ferry Building, the Sausalito to San Francisco Fisherman's Wharf, Tiburon to the San Francisco Ferry Building and Alameda/Oakland to the San Francisco Ferry Building/Wharf. The longest route is the Vallejo to SF Ferry Building route, which is approximately 24 miles. The shorter routes have travel times of 20 minutes to 30 minutes from origin to destination, while the travel time for the Vallejo route is approximately 55 minutes. Ferries carry over 13,000 riders per day and make over 65 round trips per day. In the Bay Bridge corridor ferries carry approximately 4,900 people across the Bay or one percent of the average weekday trips that are made in the corridor. Overall trends for ferry ridership over the last 10 years show increases, while the current recession has resulted in reduced ridership on some ferries. From 1990-1991 the total number of ferry commuters for that year was 2,594,347. From 2000-2001 that number increased to 4,027,712 commute trips.⁹⁹ Currently, several entities provide ferry service: Golden Gate Bridge and Highway Transportation District, Blue and Gold Fleet, City of Vallejo in conjunction with Blue and Gold Fleet, City of Alameda and Port of Oakland in conjunction with Blue and Gold Fleet and City of Alameda in conjunction with Harbor Bay Maritime.

In recognition of the expanded role that ferry service could have in the Bay Area transportation network and in order to evaluate the options for improving and expanding ferry service in the Bay Area, the legislature established the WTA. The purpose of the WTA is to develop a plan for improving and expanding ferry service in the region and to implement this plan upon its adoption. In July 2003, the WTA adopted the plan and the associated Final Environmental Impact Report. The plan is entitled *A Strategy to Improve Public Transit with an Environmentally Friendly Ferry Service: Final Implementation and Operations Plan* (IOP). The IOP describes a strategy for increasing ferry service from the existing seven routes to 15 routes, more than doubling the number of routes on the Bay.

The WTA identified those routes and terminals that could likely be implemented in the next 10 years and included these routes and terminals in the IOP as the proposed new system. The IOP describes the route selection process as "[t]o build a comprehensive system, the year-long

⁹⁸ Water Transit Authority. July 2003. *A Strategy to Improve Public Transit with an Environmentally Friendly Ferry System. Final Implementation and Operations Plan.*

⁹⁹ Water Transit Authority. July 2003. *A Strategy to Improve Public Transit with an Environmentally Friendly Ferry System. Final Implementation and Operations Plan.*

route selection process was detailed, grounded in the best available data and driven by the principle that a route must prove viable over the long term in order to be proposed. If a route passed the viability test, it faced two more hurdles in order to be recommended for further detailed study: Is the route a good transportation investment? Does the route have fatal environmental flaws?"¹⁰⁰ The IOP does not provide a definition of environmental fatal flaws, so it is unclear if this means impacts to endangered species or sensitive habitats, significant local air quality impacts, dredging and wake impacts or other environmental impacts. It is also not clear if the definition of environmental fatal flaws includes possible conflicts with shipping traffic, marine terminal facilities and motorized and non-motorized recreational boating. The new routes identified by the IOP are South San Francisco-San Francisco, Berkeley-San Francisco-Mission Bay, Richmond-San Francisco, San Francisco-Treasure Island, Antioch/Pittsburg -Martinez-San Francisco, Hercules/Rodeo -San Francisco and Redwood City-San Francisco. The projection for ridership on the new routes is over 4,000,000 additional ferry commuters per year. In addition to adding new routes and terminals, the frequency of service on existing routes will be increased to improve service. The WTA estimates that once the new routes are added and the existing system is improved, the Bay Area ferry system would serve 36,974 passenger trips daily.

As a tool for relieving Bay Area congestion, ferries will not remove a significant number of drivers from the region's bridges and roadways. However, ferries can reduce congestion and improve mobility in key corridors at peak periods. By diverting even a small percentage of drivers in congested corridors during peak periods, ferry service can have an important impact to Bay Area transportation. Ferries are also capable of filling gaps and providing transit to areas that lack other options, such as areas without rail or without express bus routes that can use HOV lanes to avoid roadway congestion. The Vallejo terminal is a good example of this type of location and the ferry service between Vallejo and San Francisco has been very successful. Vallejo ferry commuters save approximately 25 minutes in their commute time to San Francisco over people who drive to San Francisco in a single-occupant vehicle.¹⁰¹

The Water Transit Authority Implementation and Operations Plan. The new routes proposed by the WTA would require the development of nine new ferry terminals, increasing the number of existing terminals from nine to 18 (including Alcatraz). Eight of the new terminals are proposed for locations within existing marinas or ports and would not require substantial additional dredging. The exception is the Hercules/Rodeo terminal, which is not located in an existing marina or port and will need more significant dredging than the other sites. The precise locations for the new terminals were not selected during the planning process, but the plan identifies the general locations for the new terminals. These new terminals would be generally located in Antioch, Martinez, Hercules/Rodeo, Richmond, Berkeley, Mission Bay in San Francisco, South San Francisco, Redwood City and Treasure Island. The IOP also identifies routes for further study that include Port Sonoma-San Francisco, East Bay-Peninsula and ferry terminals to serve routes from Hunters Point and Moffett Field.

In addition to identifying the terminals and routes that are likely to be implemented in the next ten years, the IOP also generally identifies some of the more significant environmental impacts that may result from increased ferry service on the Bay. The IOP also makes some significant commitments to avoiding and mitigating these impacts. These commitments include using sonar and having a second officer on board to reduce the possibility of collisions with whales, designing and operating routes to provide a buffer of over 900 feet from seal feeding and resting areas, studying the potential impacts of new ferry service on rafting birds and

¹⁰⁰ Water Transit Authority. July 2003. A Strategy to Improve Public Transit with an Environmentally Friendly Ferry System. Final Implementation and Operations Plan.

¹⁰¹ Metropolitan Transportation Commission and Caltrans District 4. December 2003. Bay Area Transportation. State of the System.

mitigating ferry wakes through speed reduction, route bending, dual hull catamarans or increasing the route's distance from the shoreline. The IOP also details a program to "aggressively pursue the goal of deploying zero-emission ferries as quickly as possible." In the IOP, the WTA commits to a fleet of new boats with ultra-low emissions that will consist solely of vessels that exceed the 2007 EPA Tier II air quality standards by being 85 percent cleaner than what those standards will require in 2007.

The IOP includes general planning and operating concepts for the development of the ferry system. These concepts include ways to integrate the expanded ferry system into existing communities by providing feeder public transit to bring people from outlying areas to the ferry terminals, creating a system of pedestrian and bicycle pathways to provide safe and convenient access to the terminals and, where possible, locating transit-oriented land uses adjacent to ferry terminals. If implemented, these measures should contribute to the ridership and viability of the expanded system, increase access to the Bay and reduce automobile traffic to new ferry terminals and the amount of parking that must be located along the Bay shoreline.

The IOP describes the effort to minimize parking at the terminals as "[p]arking demand at the proposed ferry terminals is dependent upon adjacent land use, the size of the terminal's ridership catchment area, the ability to operate effective transit feeder service and the local communities' views about parking. However, a ferry system should maximize walk, bicycle and transit access, and minimize the need for parking lots, in the spirit of the *San Francisco Bay Plan*." The IOP lists three objectives regarding land use around the terminals, parking at the terminals and access to the terminals. These objectives are:

- Good connections to terminals through walking, bicycling and transit use;
- Appropriate parking at terminal locations that achieves a balance between maximizing water-transit ridership and minimizing the impacts from driving vehicles to the shoreline; and,
- Sensible land use to complement ferry terminals and encourage ridership via Water Transit-Oriented Development (WaTOD).

The IOP identifies several locations around the Bay as potential sites for transit-oriented development near ferry terminals. These sites include Jack London Square in the City of Oakland and Oyster Point in the City of South San Francisco. The IOP also identifies San Quentin in Marin County, Alameda Point in Alameda County, Martinez and Antioch in Contra Costa County as sites for future study for the potential opportunities for transit-oriented development. The IOP acknowledges the importance surrounding land uses on consistent ridership and on the success of transit service. The IOP states, "[c]learly, placing ferry terminals close to large job centers and residential areas means more people can reach water transit via foot, bicycle or shuttle, which is the experience in cities like New York, Vancouver and Sydney." In the Bay Area, the ferry terminal in the City of Sausalito is an example of a successful ferry service where the terminal is surrounded by mixed use development and has little available parking. This enables the majority of ferry riders to travel to the terminals by foot, bicycle or bus. The result is that the Sausalito ferry terminal has little impact on the shoreline, serving to enhance rather than degrade the shoreline experience and the public's access to the Bay.

Ferry Service Opportunities and Potential Impacts. In addition to serving job centers and residential areas, another opportunity for ferries is to serve urbanized areas along the shoreline that draw large numbers of people for recreation. One such example is the ferry to SBC Park from the North Bay and the East Bay. This service, which provides direct access to the ball park, has been very popular. Ferry service can serve even more people in the region if the redevelopment that occurs in the already urbanized areas or redevelopment areas along the shoreline that have, or include plans for, medium to high density residential and a mix of other uses. The importance of locating ferries in urbanized areas of the waterfront that already have, or are planned to have, mixed uses and densities that serve as origin or destination points, was illustrated by a study conducted by Washington State Ferries. In the 1999 study, entitled *Washington State Ferries Travel Service Analysis and Results*, it was found that the home addresses for most ferry riders were close to the water. The routes that relied on those people traveling

from inland areas had lower ridership levels and the majority of those that did ride the ferry drove alone to the terminal. However, the study found that programs such as improving feeder public transit service could reduce the number of people driving alone to the terminals. The study found that 24 percent of all peak evening riders accessed the ferry by a bus or shuttle and 32 percent departed the ferry by transit during this period. These numbers were up from the past and a result of improved feeder public transit service, timed bus connections and ferry to bus passes.¹⁰²

There are many advantages to ferry service, including flexibility, an ability to serve uses along the shoreline directly and increase public access and public space along the shoreline, the potential to increase access to destination areas along the shoreline, the opportunity to redevelop underused urban areas near the shoreline that could be served by ferry transit, a somewhat unique ability to serve the region during disasters or special events and the ability to transport people without requiring the construction of new roadways and bridges. Ideally, ferry transit can move people without using the already congested roadways. Ferry transit can also be a pleasant way to travel and many choose it based on the unique experience that it provides to them that would not be available on other modes of transit or in an automobile. However, there are concerns regarding ferry service. These concerns include the environmental and community impacts that such service could have, particularly in the areas where the terminals would be located. The siting, design and operation of the expanded routes, terminals and system will be the most significant determinant on what impacts expanded ferry service will have on the Bay and its resources.

Increased ferry service could affect the Bay and its resources by increased dredging and dredged spoils disposal, navigation and safety constraints, changes to the areas where people currently enjoy recreational use of the Bay and to areas that contain Bay habitats, potential wake damage to habitats and the Bay shoreline, impairment of visual and physical public access, urban growth inducement in natural and sensitive areas of the shoreline and interference with priority use area land uses that are designated by the Bay Plan. Although many of these affects on the Bay have the potential to be significant, the appropriate siting, design and operation of the terminals, routes and the system could either eliminate or substantially reduce the significance of each. Many could be avoided by locating ferry terminals in or near already urbanized locations, where dredged channels already exist, providing transit to the terminals and discouraging drivers from driving alone to the terminals through parking fees and preferred parking for van and carpools. The parking that is provided could be placed in parking structures that are sited away from the shoreline to reduce impairment of visual and physical public access resulting from large surface parking areas along the shoreline. Additional measures include bending the routes to direct increased wakes away from the shoreline and reducing speeds, not siting terminals or routes in areas that serve as habitats for sensitive Bay species, using alternative technologies to reduce the air quality impacts of the boats and designing the terminals to fit in with the existing and planned community and public access areas.

Although the WTA may initially need to develop more parking at new terminals to encourage ridership, a phasing system similar to the one described by the SMART rail project could be established that would reduce this parking over time. As previously described, the SMART rail project has designed a plan that would charge for parking and using the money collected to pay for building a parking structure and making improvements to pedestrian and bicycle access to the train stations. The areas that are no longer needed for parking could be redeveloped as areas with higher density residential, mixed and community land uses or public open spaces. In this way, the new station, or ferry terminal, is given time to mature and become part of the community. This shift can happen in a well-thought out way if a plan to shift the land from parking to community serving uses has been identified and can be implemented when the funding is available.

¹⁰² Washington State Ferries. 1999. Travel Survey Analysis and Results.

Community Impacts. Transit stations, whether bus, rail, ferry or intermodal, can have a variety of affects on a community. A transit station could bring many benefits to a community, including increased mobility and travel options, higher land values, bring new businesses and services to an area, increase connectivity to the region and generally revitalize an area. However, a new transit station could also result in localized congestion, increased noise levels, reduced air quality and increased growth pressures on an area. In most cases, the determining factors of whether a transit station would result in net benefits or net detriments to a community depend upon the siting, design and operation of the facility. For example, when BART determined that it was necessary to increase parking at the Fruitvale BART station, it designed a plan for a parking structure. The surrounding community had felt for many years that the BART station had more negative than positive effect on the community. The community felt that increasing parking at the station would just increase noise and traffic and degrade air quality. The community wanted BART to increase the number of benefits that a transit station can provide, not just exacerbate the adverse impacts with more automobile traffic. Working together, BART and the community came up with a transit-oriented development concept that included space for residential areas, new businesses and service and new areas for the community. It is hoped that this new development will energize the neighborhood, induce people to spend money in the community rather than just driving through and provide much needed housing to the area.¹⁰³

The scale of a ferry terminal will likely relate to the magnitude of the impacts that new terminals may have on Bay resources. Some ferry terminals that currently serve Bay recreation sites consist of a simple float and a queuing area. These terminals do not have buildings, large amounts of parking, formalized waiting and queuing areas and as a result, generally do not result in adverse impacts to the surrounding area. Other terminals, such as the commuter ferry terminal at Larkspur, consist of large parking areas, formalized queuing and ticketing areas and buildings. These more developed terminals can have a much greater impact on the surrounding area and, if located in a sensitive resource area or a priority use area identified in the Bay Plan, could result in elimination or degradation of natural resources or interference with priority land uses.

Ferry Terminals in Bay Plan Priority Use Areas. Some of the priority use areas that are identified in the Bay Plan also provide good sites for ferry terminals. For example, port priority use areas, water-related industry priority use areas and park priority use areas associated with marinas all provide access to deep water and existing channels that could be a good fit for ferry service. However, introducing ferry service to these priority use areas could also result in interference with the primary use of the land as a port, for water-related industry or for a marina and park. Again, the scale, operation and design will likely determine whether or not a new ferry terminal could be sited on these priority use areas without having adverse effects on the priority use at the site.

Wake Wash, Navigational Safety and Impacts to Recreational and Ecological Resources. In addition to the potential for the direct displacement of Bay resources or interference with shoreline priority use areas and public access, increased ferry service on the Bay may result in other adverse effects on Bay resources. There is a possibility for damage to the shoreline, recreation sites and habitats due to wake wash from new and increased ferry service. Wake wash has been a problem in the Bay Area and in other parts of the world. Recently, the introduction of high speed ferry service in the Pacific Northwest has resulted in reports of increased wake wash damage.¹⁰⁴ In order to reduce wake damage to the shoreline some ferry

¹⁰³ United States Department of Transportation, the Federal Transportation Administration and the Federal Transit Administration. 2001. Environmental Justice Case Studies. Fruitvale Transit Village Project.

¹⁰⁴ Stumbo Associates. The Prediction, Measurement and Analysis of Wake Wash from Marine Vessels.

service has had to significantly slow the high speed vessels from 34 to 12 knots in Washington and three vessels were taken out of service in Vancouver, British Columbia.¹⁰⁵

The potential wake wash problem is identified in the article *The Prediction, Measurement and Analysis of Wake Wash from Marine Vessels* as “[i]n the marine environment, wake wash from passing vessels can be detrimental to a shoreline environment, damage shoreline property and disturb or damage other marine operations. Slowdowns to prevent such impacts can hamper or curtail high speed vessel operations that depend on speed for successful service.” The studies that have been conducted on wake wash agree on several important concepts. The most important conclusion that most studies identify is that “[e]ach shoreline needs to be modeled individually and it is not possible to generalize on the environmental impact of ferry wash.” The studies also have found that the equation is not a simple one of controlling speed to control wake wash. A number of other factors contribute to wake wash and include the depth of water where the route is located, the characteristics of the shoreline, the characteristics of the Bay sediments and the natural wave conditions at the site.¹⁰⁶

As ferry service increases in the Bay Area it is important to recognize that other uses of the Bay are increasing or will increase at the same time. There has been a recent increase in the number of people who want to explore the Bay in hand-held boats and the idea for a Bay Area Water Trail is moving forward. The number of habitat creation and restoration projects on the Bay will likely mean an increase in the number of species that use the Bay for habitat. There has been an increase in the number of gray whale sightings in recent years and some of the proposed ferry routes have been identified as traveling through areas that are frequented by diving and rafting waterfowl and/ or marine mammals.

The amount of maritime cargo that will be coming in through the Golden Gate is projected to increase, as is the number of tankers and oil barges on the Bay. San Francisco Bay is the fourth or fifth largest port in the United States for tanker traffic and over 700 inbound vessels are oil or chemical tankers. The destination of the tankers is either Alameda or Contra Costa counties where approximately 20 oil terminals are sited along the Bay shoreline.

In an article entitled *Coast-Guard Involvement with High-Speed Craft: Past, Present, Future* the Coast Guard identifies the increase of high speed ferries in the United States as a potential risk, particularly in high-density traffic areas. The article identifies the concern by saying “[n]ot only are we seeing growth in the number of high-speed craft, we continue to see growth in waterway users.” Included in this increase is a doubling of domestic and international marine trade, a 65 percent increase in recreational boating users, an expansion of high speed ferry transportation and a rise in cruise ship traffic. Some of the recommendations that the Coast Guard makes include a special light requirement for high-speed vessels, making high-speed vessels the give-way vessel in approach situations involving risk of collision and increasing the manning levels on these vessels to include two licensed operators on the bridge at all times. These recommendations could reduce the potential risk associated with increased ferry routes on the Bay and reduce the potential for collisions with recreational boaters, marine mammals, other vessels and other users on the Bay.¹⁰⁷ The Harbor Safety Committee for the San Francisco Bay has been reviewing the safety issues associated with increasing high-speed ferry travel on the Bay. To date, the Harbor Safety Committee has been focusing on the following issues—congestion and vessel conflicts at the San Francisco Ferry Terminal, manning requirements, upgrading navigational technology and the potential for conflict between motorized and non-motorized recreational boating traffic and high-speed ferries. In order to address these issues, the Harbor Safety Committee is working on a plan that would identify

¹⁰⁵ San Francisco Estuary Project. January 2002. *Fury Over Ferries*.

¹⁰⁶ Morton, Kirk, Mr. B Elsaesser and Professor Whittaker. *Environmental Impact of Fast Ferry Wash in Shallow Water*.

¹⁰⁷ Gilmour, Captain Thomas, Captain Brain Basel and Lt Brian Willis. *Coast Guard Involvement With High-Speed Craft: Past Present and Future*.

defined ferry routes and place them on charts and developing a protocol to improve ferry boat communications.

The introduction of new ferry routes on the Bay could result in dredging new areas of the Bay. This dredging can disturb benthic communities, increase turbidity, re-suspend pollutants and change the physical characteristics of the Bay bottom. Disturbed and dredged areas have also been shown to be prone to invasion by non-native species. Areas outside of existing dredged channels also have the potential to disturb species that are currently using these areas. Some of the proposed ferry terminal sites and associated routes and those that have been identified as sites for future study have been identified as areas where there may be conflicts with sensitive Bay habitats such as tidal marshes and flats and with the species that depend upon these habitats for survival. The WTA's proposal to design the routes to keep to existing dredged channels is an important one to reducing the impacts that could be associated with new dredging and introduced vessel traffic to currently undisturbed areas.

Ferry Service in BCDC's Jurisdiction. Much of the proposed expansion of the ferry service on the Bay will be located within the Commission's jurisdiction. The Richmond and Redwood City sites are located in an area designated for port priority use in the Bay Plan. Some of the proposed sites, including the proposed terminal in South San Francisco, are located on sites designated as park priority use areas by the Bay Plan. A commuter ferry terminal in a regional shoreline park could significantly interfere with recreational use and could be inconsistent with the park uses and the Bay Plan park priority use designation. Other potential terminal sites are located near water recreation areas, sensitive habitats or on sites that will require substantial amounts of dredging. The Port Sonoma site is located in an area that has sensitive habitats and species and a large amount of protected and restored lands. This site would also be very difficult to integrate into the existing development and transportation patterns of the area and does not currently have the infrastructure to support a ferry terminal. The Moffett Field and airport terminals would likely require significant amounts of dredging to create channels for new routes. In recognition of that some of these sites may not be consistent with the route selection criteria identified in the IOP, the WTA has identified a number of these routes as routes that need further study and not as the routes that will be implemented in the next 10 years. The location, scale, design and operation of each terminal site will largely determine whether the development of each site will threaten or enhance Bay resources.

The Bay Plan currently identifies only one potential ferry terminal site. The Plan Map Notes identify Point San Quentin as a possible commuter ferry terminal and Commission Suggestion B on Plan Map 4 is generally located to identify the site. Rather than increase the number of possible ferry terminal sites identified on the Bay Plan maps, the findings and policies are designed to guide the siting of ferry terminals to appropriate sites. With the establishment of the WTA, it seemed better to rely on its IOP and planning process to identify generally identify those areas where ferry terminals could improve the regional transportation network. BCDC's findings and policies should be used to guide site selection to avoid impacts to Bay resources. The Point San Quentin reference is retained on Bay Plan Map 4, but moved from north of the Richmond-San Rafael Bridge to south of the bridge. The original suggestion was placed in the wrong location in 1968 and currently identifies the site of the Marin Rod and Gun Club. In order to eliminate the confusion that has occurred over this suggestion, it is being moved to the site of the San Quentin State Penitentiary. This site has been studied by Marin County as a possible site for a future ferry terminal and surrounding transit oriented development. It has also been identified by the SMART project as a possible site for a ferry terminal at the terminus of the proposed rail line and by the WTA as a site for future study. Currently, the site serves as San Quentin State Penitentiary and the State of California is not proposing to move the penitentiary at this time. The primary purpose for moving the suggestion is to correct a map error made over 30 years ago, when the suggestion should have been placed south of the bridge rather than north. Moving the suggestion is also consistent with other planning that has been done in the region.

CHAPTER 7

GOODS MOVEMENT

Bay Area Trends. A critical component of the transportation system in the Bay Area is the movement of goods from the region's seaports and airports. The gross national product of the San Francisco Bay Area region ranks fifth in the nation and twentieth in the world, exceeding \$200 billion annually. Although goods movement in the Bay Area is of international significance, approximately 46 percent of goods moved in the Bay Area have both an origin and a destination within the region. The Bay Area contains several significant gateways for goods movement, including the Port of Oakland, the San Francisco International Airport and the Oakland International Airport. The Port of Oakland is the fourth busiest container port in the country. Overall, projections for port container traffic and air cargo volumes show significant increases, tripling by 2020. The overall volume of goods movement is expected to increase by 56 percent between 1996 and 2016. The amount of cargo that moves through the airports will also increase substantially and air cargo is the fastest-growing freight mode. Another important economic factor for the Bay Area is that port operations employ a large number of people in the region.¹⁰⁸ Over 37 percent of Bay Area economic output comes from businesses that focus on manufacturing, freight transportation and warehouse and distribution.¹⁰⁹ The number of tankers and oil barges traveling to the approximately 20 oil terminals in Solano and Contra Costa counties is also projected to increase, resulting in an increase in the amount truck movement and other activity around these terminals.

Much of the increase in maritime cargo volume will be accommodated by the Port of Oakland, which has become the primary goods movement port in the region, particularly for containerized cargo. China and Japan are the number one and two trading partners both in imports and exports, with computer equipment, office machines, automobile parts and electrical appliances coming into the Bay Area region and power-generating, electrical and metal working equipment, industrial machinery, cow and chicken meat and agricultural products being shipped out. Air cargo volume is projected to triple between 1998 and 2020, with Oakland International Airport handling most of the domestic air cargo and San Francisco International Airport handling international cargo.¹¹⁰

Trucking moves most of the cargo in the Bay Area and goods movement generates a considerable amount of ground traffic, particularly in those corridors around the ports. Freeway congestion in these corridors can add to the cost of moving the goods and, as a result, increase the cost of these goods. The corridors that are most significantly impacted by trucks moving goods to and from the main port facilities are Interstate 880, Interstate 380, portions of Interstate 580 and Highway 101. Interstate 880 is the primary intraregional goods movement corridor, Interstate 580 is the primary connection between the Bay Area and the national interstate truck network and Interstate 80 is the primary connection to the transcontinental truck network. The amount of truck traffic in the corridors that serve the ports increased significantly during the 1990s and these increases are projected to continue. From 1997-1998 to 2000-2001, the volume of trucks on portions of Highway 101 increased as much as 39 percent. The average daily truck traffic during 1999 to 2000 for the portions of Interstate 880 near the Port of Oakland was approximately 20,000 trips in both directions. Rail carries the second highest volume of cargo, much of it being crushed stone for construction, autos, steel, petroleum products, waste and

¹⁰⁸ Pacific Maritime Magazine. "Regional Report: San Francisco Bay and Delta Ports: Surviving Economic Downturn," in June 2003 issue by Wes Starratt.

¹⁰⁹ Bay Area Monitor. April/May 2004. Freight Movement in the Bay Area.

¹¹⁰ Metropolitan Transportation Commission. 2004. Regional Goods Movement Study for the San Francisco Bay Area. Final Summary Report.

scrap. The oil refineries and auto terminals along the Suisun Bay generate a significant amount of goods movement rail traffic.¹¹¹

The most significant time component for moving goods through the Bay Area's ports and airports is truck delays created by congestion and access constraints. Some of the most important links for goods movement are also some of the most heavily traveled roadways in the region, such as Interstate 80 and Interstate 580. Between 1996 and 2000, truck traffic increased by approximately 12 percent on Interstate 580, up to 105 percent on portions of Interstate 80, by 84 percent on the Bay Bridge and by slightly over 50 percent on Interstate 880. In the majority of cases, the locations where these increases have occurred are the same areas where single-occupancy vehicle traffic is also increasing or where projections show significant increases in single-occupant vehicle travel. Interstate 580 has experienced significant increases in single-occupancy vehicle volumes over the last decade due to the amount of residential growth that has occurred in cities around that corridor, such as Pleasanton, Livermore and Tracy.¹¹²

Community and Land Use Compatibility. Congestion not only reduces the efficiency and cost of goods movement. Congestion can also have significant noise, traffic, safety and air quality effects on neighborhoods and communities as well. Congested roadways can result in truck operators searching for less congested routes, which can mean surface roadways through neighborhoods. The neighborhoods surrounding large ports bear the disproportionate impacts, such as truck traffic, noise, air pollution and significant disruptions to the physical and visual connections in the neighborhood. The Port of Oakland generates approximately 7,900 heavy trucks per day, all traveling through West Oakland for a portion of their trip. Approximately 1,370 of these trucks do not use the freeways on a daily basis and either travel on surface streets or stay in the neighborhood.¹¹³ A recent concern of the West Oakland residents and businesses was the number of heavy trucks traveling on and parking along the streets of the community; this congestion results partly from a lack of parking for trucks and partly from truck operators strategically positioning themselves for both delivery and pick up times.

The noise, air quality and traffic that is associated with ports and the raising land costs in the areas surrounding ports have started to affect land use trends around ports. To reduce congestion associated with ports, revitalize previously industrial areas and capitalize on increasing land values, cities have begun to re-zone industrial areas around the ports to more mixed-use, commercial and residential uses. To this same end, cities have also begun to require additional discretionary permits for ancillary port uses and port support services, including truck parking and maintenance.¹¹⁴ One result of these land use trends is that some port uses are moving further inland, away from the central cities. Moving some port functions inland may result in more truck miles traveled, more emissions associated with the trips, longer travel times and higher costs for goods movement. The lack of land around the ports for ancillary port uses may also force the ports to accommodate some of the uses on port lands, rather than on land adjacent to the port. This increases the amount of land dedicated to port uses at a time when less land is available to port operators.

These land use conflicts, along with transportation corridor congestion can reduce the efficiency and increase the cost of transporting goods and ultimately may result in constraining port growth. The Port of Oakland has identified concerns regarding congestion and capacity of Interstates 880 and 580 and of local access roads, the limited amount of truck parking and the land use adjacency concerns of the surrounding community. The congestion on the Interstate 880 corridor between Oakland and San Jose, which receives the most truck traffic in the region, slows the movement of trucks transporting goods to and from both the Port of Oakland and

¹¹¹ Metropolitan Transportation Commission and Caltrans District 4. 2003. Bay Area Transportation State of the System.

¹¹² Metropolitan Transportation Commission. 2002. State of the System.

¹¹³ Tioga Group. June 2001. Port of Oakland Port Services Location Study.

¹¹⁴ Tioga Group. June 2001. Port of Oakland Port Services Location Study.

Oakland International Airport. This corridor is not only serves the highest number of trucks, it also has the highest number of truck accidents in Northern California.¹¹⁵

Goods Movement Alternatives. Possible solutions that have been tried in other regions include separate lanes for truck traffic, the use of rail to move goods from ports through congested urban areas, the use of ferries to move goods and operating the ports 24 hours a day to avoid peak traffic congestion. The Port of Oakland's recent project, the Joint Intermodal Terminal, expanded the capacity of the port and increased the efficiency of moving the goods to and from the port. By using a rail system between the Port of Oakland and the Port of Richmond, this project should reduce truck trips between these two ports by approximately 33,088 trips annually. Additionally, the recent rebuilding of Interstate 880 allowed for the development of a system of on-ramps and off-ramps designed to better accommodate port traffic and make more direct connections between the port and the freeway. The port also worked with the City of Oakland to set aside an area to accommodate truck traffic. All of these initiatives can improve goods movement, while reducing the impacts to the surrounding community by removing or reducing truck traffic and truck parking from the neighborhoods near the port.¹¹⁶ However, the increased amount of rail traffic associated with goods movement to and from the Port of Oakland is now required to compete with the increased commuter rail service on the Capitol Corridor. This congestion causes delays for commuters and goods transport and disturbs residents of nearby communities.

Another solution being proposed is to move cargo by rail on a container shuttle train that would operate between the Port of Oakland and the San Joaquin Valley. The project is called the California Inter-Regional Intermodal System (CIRIS) and would divert container cargo from trucks to a rail system that could move the cargo without using the Bay Area's congested roadways. Another rail project that is aimed at relieving congestion at the Southern California ports is called the Shafter Shuttle. The Shafter Shuttle project would take cargo that had been diverted from the congested Southern Californian ports to the Port of Oakland and move it by rail south from the Port of Oakland to a distribution center in the City of Shafter.¹¹⁷ Among the advantages to diverting cargo from trucks to rail are reduced emissions, reduced congestion on the surface roadways around the ports and fewer accidents involving trucks on corridors. MTC's *Regional Goods Movement Study—Final Summary Report* described the reliability problems as a result of incident-related delay, stating, "Poor reliability due to incident-related delay is a fact of life in many goods-movement corridors that affects on-time performance and adds significant costs to shippers. In older corridors that were not designed to handle trucks (such as parts of I-880), accidents involving trucks are common and a major cause of unreliability."¹¹⁸ Reliability would increase as well; as surface roadway congestion is not always predictable and parallel corridors for trucks do not exist in many parts of the Bay Area. However, cargo movement by rail increases the amount of handling for each container, decreases efficiency and is still more expensive than movement by truck. It is possible though that congestion in the central Bay Area will make rail competitive, as it offers a reliable way to bypass the surface roadway congestion.

In addition to rail, other regions have developed dedicated lanes for truck traffic or used ferries to move freight. The development or conversion of lanes for exclusive truck traffic would be very difficult in the already built up Bay Area. The freeways used by trucks in the region are heavily traveled by automobiles, which would preclude the ability to convert existing lanes to truck only lanes without significantly increasing congestion in the remaining lanes. The

¹¹⁵ State of California. 2002. Global Gateways Development Program.

¹¹⁶ Tioga Group. June 2001. Port of Oakland Port Services Location Study.

¹¹⁷ Bay Area Monitor. February / March 2005. More Speed, Less Pollution Possible for Shippers.

¹¹⁸ Metropolitan Transportation Commission. December 2004. Regional Goods Movement Study for the San Francisco Bay Area. Final Summary Report.

construction of new lanes would have significant community and environmental impacts that would most likely outweigh any positive effects such lanes would have on the region. Since most of the freeways are located in urbanized areas, the construction of new truck-only lanes may require the elimination of existing communities to obtain right-of-ways for such lanes.

The use of ferries to move freight in the Bay Area has been discussed by various groups and the research to date has indicated that moving freight by ferries in the Bay Area is not yet cost effective. However, as congestion increases on the roadways, ferries become a potentially viable way to address the capacity constraints of the roadways and land areas around the ports to accommodate more trucks. Studies conducted in New York have indicated that the use of freight ferries can address many of the problems that ports in both regions are facing, including congestion on local roadways and connecting freeways, the lack of truck parking areas around the ports, the air pollution concerns regarding increased truck traffic and many of the community impacts associated with increased truck traffic.¹¹⁹ The most specific proposal for the Bay Area is a freight ferry service that would connect San Francisco International Airport with Oakland International Airport to reduce the amount of time to move goods between the airports. A ferry freight service between the airports would provide a more direct link between the airports and reduce the delays caused by surface roadway congestion around the airports. There has also been discussion in the past of moving cargo by ferries from the central Bay to the Port of Stockton in the Delta.

Goods Movement Planning. MTC has recognized the critical nature of these issues to the transportation system and the economy of the Bay Area and has completed a report entitled the *Regional Goods Movement Study for the San Francisco Bay Area, December 2004* (Goods Movement Study). The purpose of the Goods Movement Study is to help MTC determine the appropriate allocations of transportation funds to address goods movement issues and to inform local decision makers as to the impacts that infrastructure, zoning and other decisions have on goods movement. The study begins by stating, “[g]oods movement is an integral element of the Bay Area economy and transportation system. Local businesses rely on the goods-movement system to receive supplies. Residents rely on the goods-movement system to bring consumer goods to the region. And Bay Area seaports and airports are major international trade gateways for the rest of California and the United States.” The goals of the Study include: determining the economic significance of goods movement in the Bay Area and identifying the most appropriate investment strategies and policies for improving goods movement in the region. In addition to the study, MTC included efficient freight travel as one of the six goals in the 2030 Plan, the update to the 2001 RTP.

The Goods Movement Study came up with a series of investments and planning strategies to improve goods movement in the region. The strategic investments include: transportation improvements and the preservation of industrial land in the Interstate 880 corridor; tolled truck-only lanes and truck climbing lanes on Interstate 580; completion of improvements at the Interstate 80/Interstate 680/Route 12 interchange; operational improvements to Highway 101 between San Jose and San Francisco; grade-crossing improvements for rail for safety and efficiency; operating subsidies for short-haul intermodal rail service; and further research into a fast ferry system linking the airports. The study also makes the following recommendations regarding better planning: making the connection between land use decisions and goods movement; expanding the scope of the Regional Airport system Study and the San Francisco Bay Regional Seaport Plan to include land uses in key locations likely to be needed to support seaport and air cargo facilities and developing coordinated city/county truck route plans.¹²⁰

Goods Movement Projects in BCDC's Jurisdiction. At this point it is too early to identify specific projects that may be proposed to improve goods movement in the Bay Area. However,

¹¹⁹ Weisbrod PhD, Roberta. April 16, 2002. Freight Ferries for New York/New Jersey Harbor.

¹²⁰ Metropolitan Transportation Commission. 2004. Regional Goods Movement Study for the San Francisco Bay Area. Final Summary Report.

it is likely that some of the projects that may be necessary to support port activities will be within the Commission's jurisdiction and will have impacts on the policies and objectives in the *Regional Seaport Plan and the Regional Airport Plan*. BCDC should continue to participate in regional projects and studies that look at ways to improve the functions of the ports.

